AUGUST 1955

## Now It's Clean Air – or Else!

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# FACTORY

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Final assembly area in plant of Lycoming Division, Avco Manufacturing Corporation, Stratford, Conn. Archts. & Engrs.—Giffels & Vallet, Inc., Detroit, Michigan; Contr.—George A. Fuller Co., New York City.

long-life

Gardner Board & Carton Co. Plant, Lockland, Cincinnati, Ohio. Archt.—Carl H. Martin, Middletown, Ohio; Assoc. Archt.—Emory J. Ohler, Dayton, Ohio; Contr.—Penker Constr. Co., Cincinnati, Ohio.

WAV

PAG

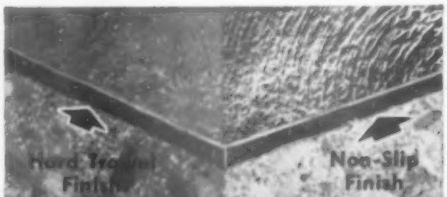
## ..."iron-clad" floors produce

*better in these ways:*

- **4-6 times more wear-resistant** than best plain concrete floor
- **non-slip, spark-safe**
- **non-dusting**
- **corrosion-resistant**
- **easy-to-clean**

Long-term experience in all types of plants the country over has proved the value of Masterplate "iron-clad" concrete floors in helping to maintain a smooth flow of production, reduce maintenance expense and improve plant safety.

Only with Masterplate can you obtain a Masterplate "iron-clad" concrete floor with its important advantages. Write for the Masterplate "see-for-yourself" demonstration kit and you'll find out why.



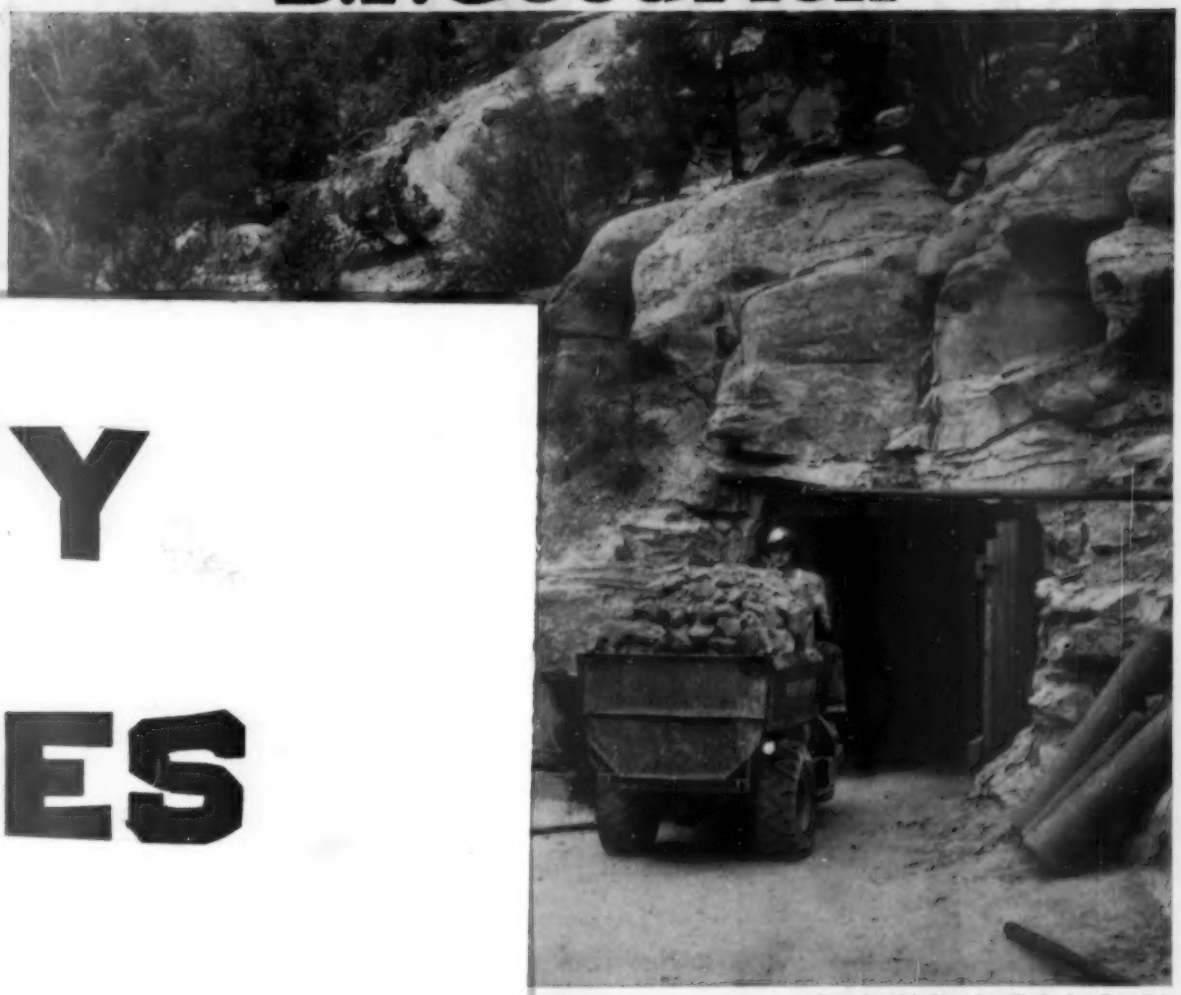

Section of Masterplate Floor. Note Thickness of Armored Surface.

Non-shrink Embeco Pre-Mixed Grout and Non-shrink Embeco Pre-Mixed Mortar provide: convenience and ease-of-use; time and labor savings; assurance of uniformly superior results. Write for information and where to buy in your area.

The MASTER BUILDERS Co

Subsidiary of American-Marietta Company

RESEARCH KEEPS **B.F.Goodrich** FIRST IN RUBBER



Ore carrier made by Gotman Iron. Mfg. Co., South Haven, Mich.

# ...AVY ...AGES

# Here comes uranium for the atomic submarine

*A typical example of B. F. Goodrich improvement in rubber*

OUT of that hole comes the powerful stuff that will make atomic fuel. Climbing up the narrow, twisting tunnels of the uranium mine are trucks so small and compact that there's no room for clutch and gears. Instead they use V belts to run them. But for a while this type of truck wasn't practical because the belts kept breaking. They sometimes lasted only a few days.

All kinds of belts were tried but they couldn't stand the jolting starts and stops, heavy loads, rough driving. Some would snap like pieces of string.

Then the manufacturer heard about Grommet belts invented by B. F. Goodrich engineers. The grommets are two extra strong cord loops inside the belts, like twisted cables except they're endless. High-capacity Grommet belts were put on the trucks. They're so much stronger they last months instead of days.

Product improvement like this is *always* going on at B. F. Goodrich. New ways are constantly being found to make V belts, conveyor belts and hose work better, last longer. No product is ever regarded as "finished" or standardized.

*How this cuts your costs:* Biggest cost savings come almost always from top performance rather than lowest prices. If you use rubber products, remember B. F. Goodrich is one company that will *never* lower its quality standards. This means you can be sure of top performance and real money savings when you buy from your B. F. Goodrich distributor. *The B. F. Goodrich Company, Dept. M-452, Akron 18, Ohio.*

Grommet—T. M. The B. F. Goodrich Co.

**B.F.Goodrich**
**INDUSTRIAL PRODUCTS DIVISION**

Final assembly area in plant of Lycoming Division, Avco Manufacturing Corporation, Stratford, Conn. Archts. & Engrs.—Giffels & Vallet, Inc., Detroit, Michigan; Contr.—George A. Fuller Co., New York City.

Fleming Wholesale Grocery Co. Warehouse, Wichita, Kansas. Archt.—Parr & Aderhold; Contr.—Industrial Construction Co.—both of Oklahoma City, Oklahoma.

# long-life floors

Gardner Board & Carton Co. Plant, Lockland, Cincinnati, Ohio. Archt.—Carl H. Martin, Middletown, Ohio; Assoc. Archt.—Emory J. Ohler, Dayton, Ohio; Contr.—Penker Constr. Co., Cincinnati, Ohio.

Western Pacific Railroad Warehouse, Sacramento, California. Archt.—Plans by Western Pacific Railroad; Contr.—N.H. Sjoberg and Son, Oakland, California.

## ..."iron-clad" floors produced with MASTERPLATE

*better in these ways:*

- **4-6 times more wear-resistant** than best plain concrete floor
- **non-slip, spark-safe**
- **non-dusting**
- **corrosion-resistant**
- **easy-to-clean**

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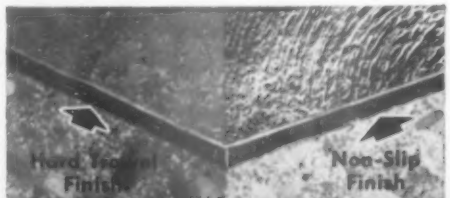


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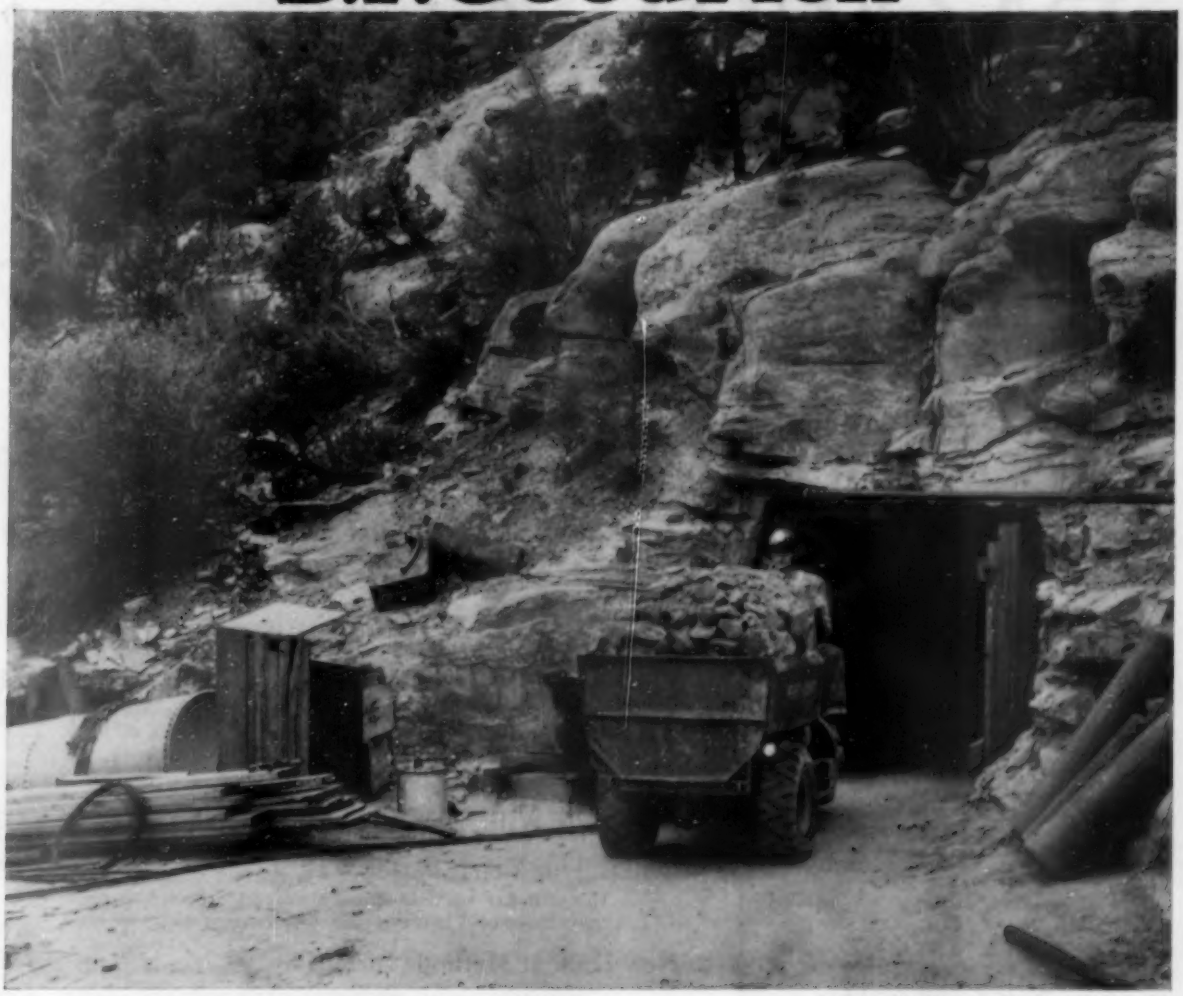

Ore carrier made by Gotman Iron. Mfg. Co., South Haven, Mich.

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Grommet—T. M. The B. F. Goodrich Co.

**B.F. Goodrich**
**INDUSTRIAL PRODUCTS DIVISION**

# FACTORY | Reader's

MANAGEMENT AND MAINTENANCE

THE MAGAZINE
OF PLANT MANAGEMENT
FOR 64 YEARS

A McGRAW-HILL PUBLICATION

Member of Associated Business Publications and Audit Bureau of Circulations

FACTORY MANAGEMENT AND MAINTENANCE
AUGUST 1955 Vol. 113, No. 8

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**YOUR GOODYEAR DISTRIBUTOR** *can quickly supply you with Hose, Flat Belts, V-Belts, Packing or Rolls. Look for him in the yellow pages of your Telephone Directory under "Rubber Products" or "Rubber Goods."*

Ortac—T.M. The Goodyear Tire & Rubber Company, Akron, Ohio

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Division of West Virginia Pulp and Paper Company

**AUTHORITY ON PACKAGING • SANDUSKY, OHIO**
**13 FACTORIES • 40 SALES OFFICES**

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## TO BRING OUT THE BEST IN THIS MASSIVE MACHINE

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—Baker quality permits full 6 months' warranty.

**3 HIGHER LIFT**
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**4 LOWER MAINTENANCE COSTS**
—Designed for easier and less frequent servicing.

**5 MORE MANEUVERABLE**
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**7 GREATER STABILITY**
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**8 BETTER BRAKING**
—Full floating, self-equalizing, self-energizing brakes.

*Write for descriptive literature.*

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Baker handling equipment

A Subsidiary of Otis Elevator Co.

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## changes world picture...and advances the use of abrasives.

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**ANCIENT HITTITES** discovered iron about 1300 B.C. in what is now Armenia, and began distributing it throughout the Near East. Iron daggers abraded to a smooth finish were the first implements made of the new metal. Perhaps the first instance of iron being mentioned in connection with weapons was a gift of a dagger from the Hittite King Hattusil to his son-in-law, Ramesis II of Egypt.

**IN 1000 B.C.** the scourge of the civilized world were the Assyrian hordes. Their armies were the first to be equipped with weapons of iron. Arrow tips, spears, and scythes attached to chariots were made of cast or hammered iron crudely abraded by stone and silica.

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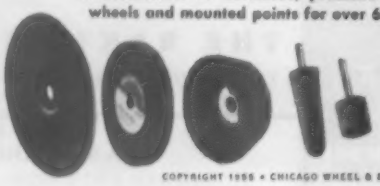

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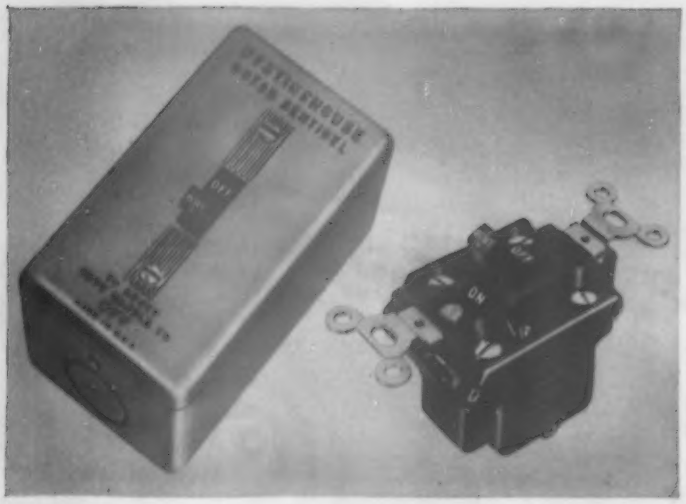
## today's greatest value

## for more positive small-motor protection!



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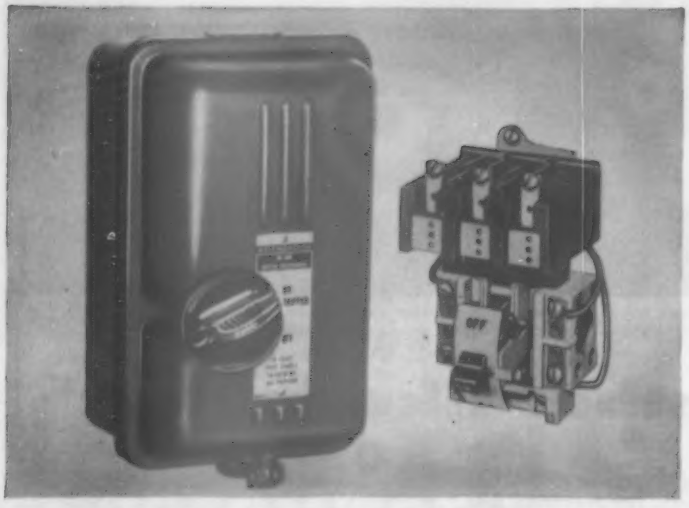
*Trade-Mark



De-ion® Motor Watchman in NEMA 12 enclosure.

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**of processes requiring variable speed control**

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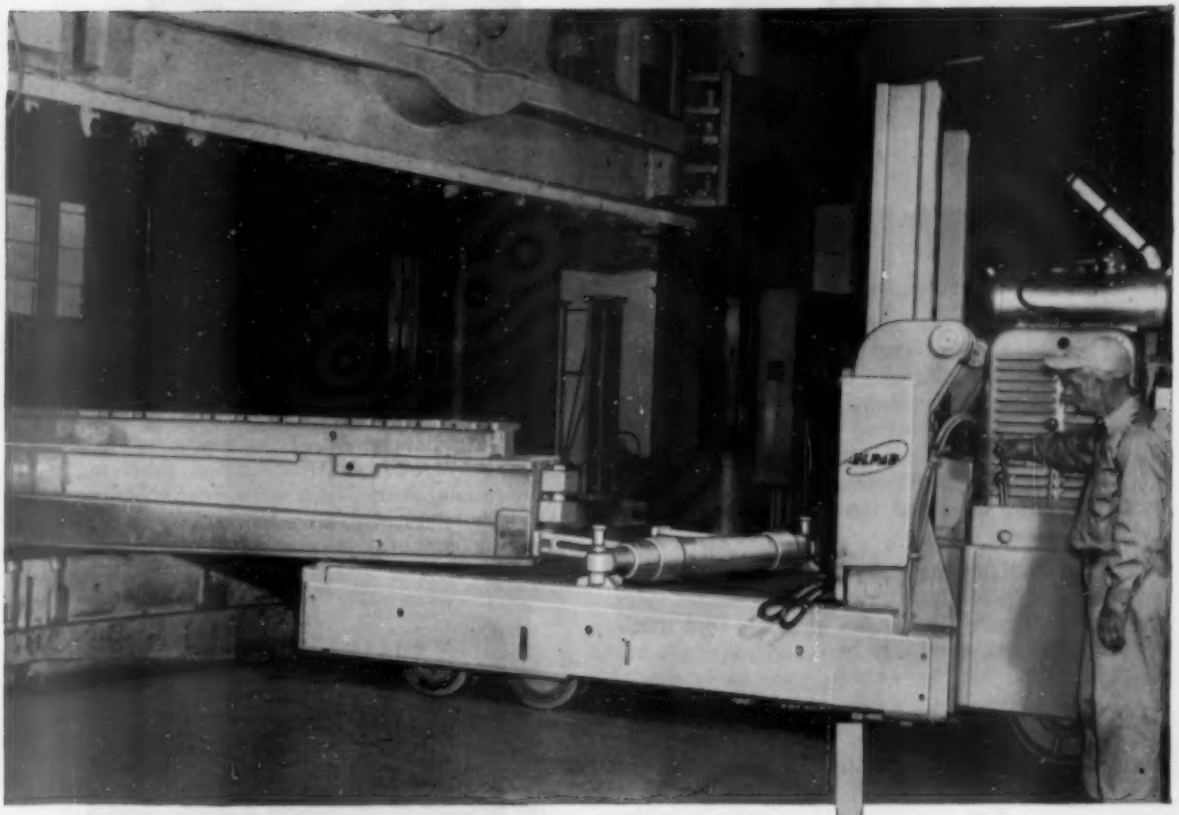


ELPAR truck in Lockheed aircraft plant. Note that operator is using remote controls. Die is being turned as it is pushed into press. *In only 8 minutes,* truck picks up from storage, delivers, and positions a multi-ton die!

# *Exclusive Features of NEW*

# *ELPAR* Die Handler*

## *Speed Die Changing*

Fast changing of stamping and forging dies is a "must" to keep waiting time of huge presses at a minimum. The entirely new line of ELPAR die puller trucks handles 5 to 50-ton dies with unmatched speed and safety. Here are some of the reasons:—

**FINGERTIP CONTROL**—Exclusive *hydraulic* operation of *both* lift and die pulling mechanism permits "*inching*" action. Hydraulic valves can be barely cracked to permit accurate positioning of platform and alignment of die in press. Such exactness is impossible with electric controls.

**INDEPENDENT OPERATION OF PUSHER ARMS**—Pusher arms can operate together or separately to maneuver die. If necessary, a die can be pushed off diagonally even when platform is not square with press bed. This saves time of maneuvering truck. Die can be turned as it is pushed into press.

**LOWER PLATFORM**—Because today's press beds are lower, ELPAR trucks provide lowest possible platform with no sacrifice in capacity.

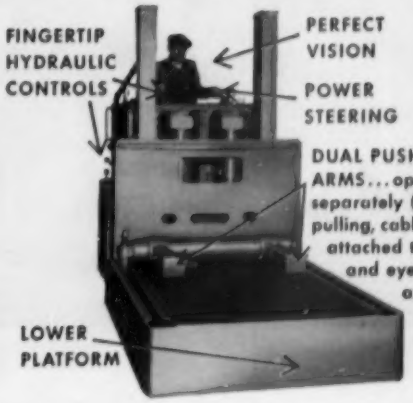
**FULL VISION**—No lift chains or cables between uprights, and no cross member at top. End control permits view of entire truck.

**MANEUVERABILITY**—Effortless hydraulic power steer. Short turning radius because all wheels steer.

*Elwell-Parker trade name.

**THE ELWELL-PARKER ELECTRIC CO.**
4028 St. Clair Avenue — Cleveland 3, Ohio

### *ELPAR FEATURES:*


FINGERTIP HYDRAULIC CONTROLS
PERFECT VISION
POWER STEERING
DUAL PUSHER ARMS... operate separately (For pulling, cables are attached to die and eyes on arms.)
LOWER PLATFORM

**ASK FOR FULL FACTS ON NEW ELPAR DIE PULLERS**

# Why You Should Modernize Electrically

VOLTAGE DROP COSTS YOU MONEY . . . in torque losses, lighting losses, and production losses. The cause is usually an outmoded or overloaded plant electrical system. Correcting low voltages is easy with Allis-Chalmers unit substations; and, in addition to eliminating these losses, you get new flexibility in plant arrangement that usually pays extra dividends.

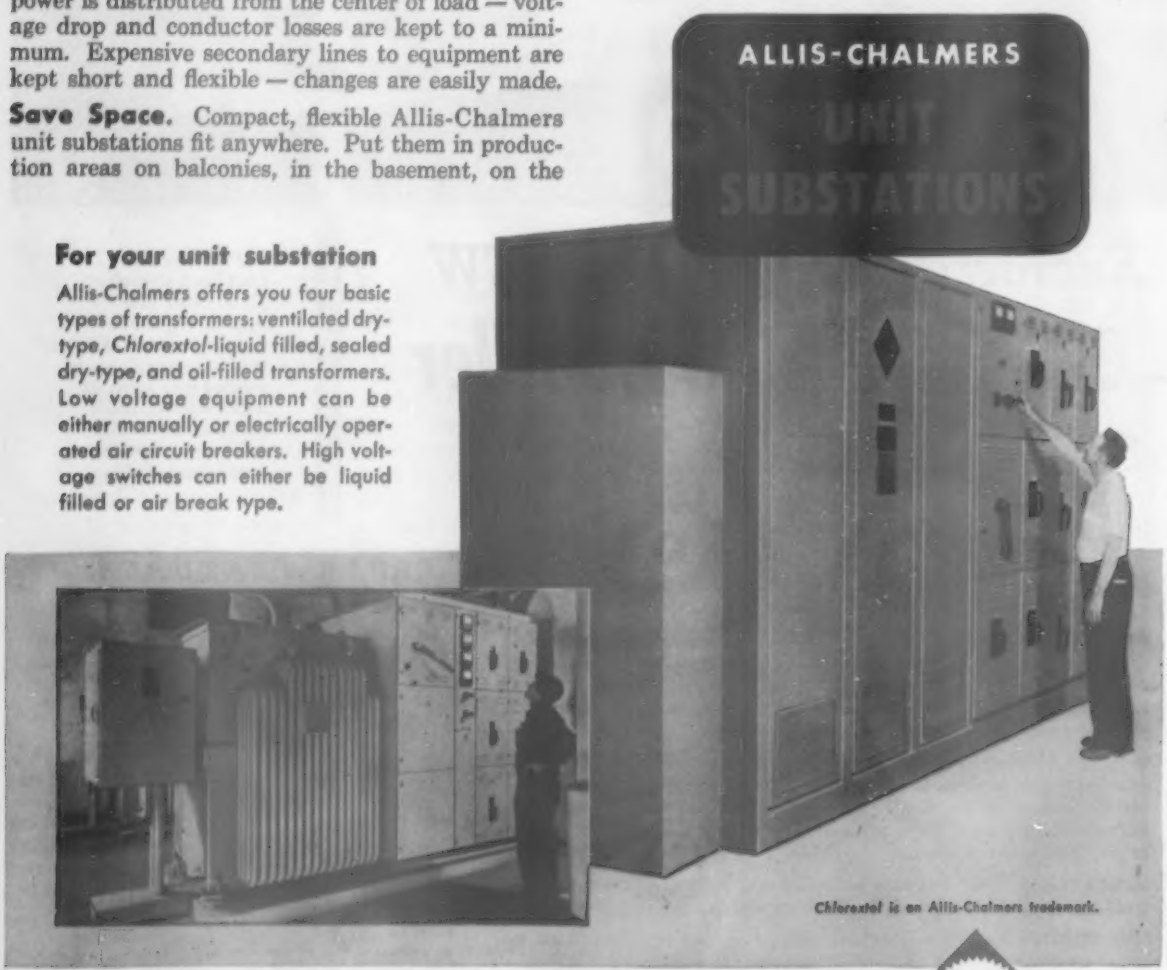
**Get Your Full Value.** You save because *full* power is distributed from the center of load — voltage drop and conductor losses are kept to a minimum. Expensive secondary lines to equipment are kept short and flexible — changes are easily made.

**Save Space.** Compact, flexible Allis-Chalmers unit substations fit anywhere. Put them in production areas on balconies, in the basement, on the roof, or outside the building. Entirely metal-enclosed, they may be located with complete safety — no enclosures are required.

Let experienced Allis-Chalmers substation engineers help you solve distribution problems. Call your nearby Allis-Chalmers district office, or write Allis-Chalmers Mfg. Co., Milwaukee 1, Wisconsin, for your copy of "Power at Load Centers Pays Off" (11B6285B). A-4604

**For your unit substation**

Allis-Chalmers offers you four basic types of transformers: ventilated dry-type, *Chlorextol*-liquid filled, sealed dry-type, and oil-filled transformers. Low voltage equipment can be either manually or electrically operated air circuit breakers. High voltage switches can either be liquid filled or air break type.




*Chlorextol* is an Allis-Chalmers trademark.

**ALLIS-CHALMERS**

# Spend 25% Less

## AND DOUBLE YOUR MATERIALS HANDLING EFFICIENCY!

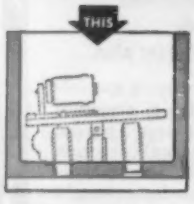
Pallet type illustrated . . . also available in platform models.

When your material handling volume and hauling distances increase beyond a certain point the rider-type truck is more practical than the operator-led type. The end-control low lift Transveyor is a medium duty truck designed to speed the moving of materials through *all* your plant operations, from Receiving through Stores —Production—Warehousing—to the Shipping Dock.

One 4000 lb. *Transveyor* will move as much materials per 8 hour shift as two 4000 lb. operator-led trucks—carry it 50% faster at approximately 40% lower operating cost. Operation is more efficient, too, because the riding operator is less subject to fatigue. Nevertheless, one Transveyor actually costs 25% less than the two operator-led trucks it displaces. Why not find out what this truck can do for you? No obligation—just mail the coupon.

***Mail Coupon Today!***

## Only TRANSVEYOR Has Balanced Action




**THIS**
Uneven floor surfaces are compensated for by the exclusive center-pivoted feature. This eliminates frame distortion and uneven load distribution.

**THIS**
Drive and idler wheels are connected by a tie rod and steer simultaneously. This greatly increases tire life by eliminating scrubbing action.

**NOT THIS**
With the conventional rigid axle mounting, uneven floors can cause improper load distribution, chassis distortion, and excessive wear.

**NOT THIS**
Uncontrolled action of caster follower and single steering wheel results in excessive tire damage and wear as well as unnecessary chassis vibration.

# Automatic®

**WORLD'S LARGEST EXCLUSIVE BUILDERS OF ELECTRIC-DRIVEN INDUSTRIAL TRUCKS**

**Automatic** 39 West 87th Street, Dept. M-5
Chicago 20, Illinois

Please rush to me, without cost or obligation, New TRANSVEYOR data folder and a copy of your booklet "Materials Handling COST CUTTER" to help me analyze our materials handling requirements.

Firm .....

By ..... Title .....

Street .....

City ..... Zone .... State .....

# WANTED

## for compounding heating costs

## Old Unit Heaters

**that have begun to fail**

***CRIMES INCLUDE:***

- **Stealing costly maintenance man-hours**
- **Production holdups**
- **Grand larceny of heating efficiency**

## REWARD Modine's new liberal exchange plan

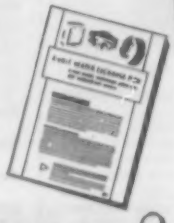
To protect you against the costs and hazards of obsolescence, Modine has established a liberal exchange or trade-in plan. It provides for the exchange of old unit heaters for new Modines at a favorable cash allowance. Now is the time to take advantage of this plan and be ready for the coming heating season.

**It pays to standardize, too**

Yes, leading industrial firms have found that they get additional savings when they standardize on Modine Unit Heaters as a result of (1) simplifying purchasing and installation; (2) speeding routine servicing; (3) having the wide-spread parts interchangeability.

**NEW FREE BOOKLET DETAILS REPLACEMENT PLAN**

*Before you repair or replace any unit heater, get the booklet — "A UNIT HEATER EXCHANGE PLAN". Ask your representative . . . or write to Modine Mfg. Co., 1505 DeKoven Ave., Racine, Wisconsin.*



**Modine special corrosion-resistant HCR Models available under plan**

Modine offers a specially-built line of premium units for systems having severe internal corrosion problems. These models retain the light weight and top performance of standard Modines.

**Modine**
**UNIT HEATERS**

SU-1275

# Pittsburgh COLOR DYNAMICS®

**Helps Achieve Ultra-Accurate Workmanship in Graflex Plants**

**By reducing eye fatigue, properly engineered colors aid operators to make world-famous camera equipment with less re-work and scrap!**

**Let Us Make an Engineered Color Study of Your Plant—FREE!**

● Why not investigate what COLOR DYNAMICS will do in your plant? Send for our free book which explains this painting system and how to use it. Better still, call your nearest Pittsburgh Plate Glass Company branch and ask to have a representative give you a comprehensive engineered color study of your plant—without cost or obligation. Or mail coupon at right!

**PITTSBURGH'S PAINTING SYSTEM** of COLOR DYNAMICS, purposefully used on walls and machines in the plants of Graflex, Inc., of Rochester, N. Y., improves the efficiency, safety and morale of the operators who make the world's best-known high-speed cameras.

**Photographic equipment** made by this pioneer maker is known to press and cameramen for its versatility and reliability. Industry and military use its identification and microfilming cameras. Telephone companies use its meter-recording cameras. To the Armed Services, Graflex is a leading source of combat and aerial cameras, artillery telescopes and fire-control devices.

**The many ways** in which operators in the Graflex plants benefit by the use of COLOR DYNAMICS are best summarized in this comment of M. B. Moore, vice president and factory manager:

**"Because** of the precision our production requires, it is important that our operators have the best possible seeing conditions. By painting walls and ceilings in eye-rest colors and by using colors on machinery that differentiate working from stationary parts, according to COLOR DYNAMICS, we have relieved eye strain and reduced physical fatigue. An appreciable part of the reduction in re-work and scrap can be attributed to this improvement of our operators' environment.

**"Safety, too,** has been improved. Our recent record of 411 working days without a lost-time accident gained for us an Award of Merit from the National Safety Council. This improvement in productive efficiency and safety has enhanced morale, creating friendlier relationship and greater cooperation among the members of our organization."

**Send For FREE Book!**

Pittsburgh Plate Glass Co., Paint Div.
Department PM-85, Pittsburgh 22, Pa.

☐ Please send me a free copy of your booklet "Color Dynamics."

☐ Please have your representative call for a Color Dynamics Survey without obligation on our part.

Name_____

Street_____

City_____

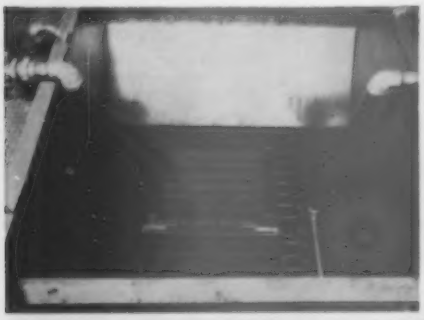
County_____ State_____

# PITTSBURGH PAINTS

PAINTS • GLASS • CHEMICALS • BRUSHES • PLASTICS • FIBER GLASS

PITTSBURGH PLATE GLASS COMPANY

IN CANADA: CANADIAN PITTSBURGH INDUSTRIES LIMITED



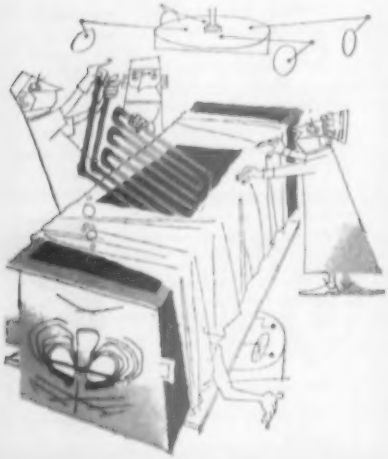
# PLATECOILS®

## speed cooling in subterranean quench oil tank

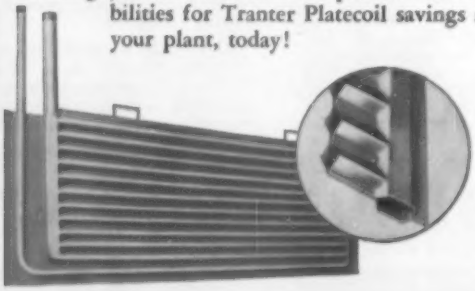
*as* **coil-itis** * *is cured at National Acme*

### PLATECOILS *cure Coil-itis**

**Platecoils overcome the limitations and operating difficulties of pipe coils by heating or cooling 50% faster, taking 50% less space and saving up to 50% on initial and maintenance costs.**



A bank of Tranter Platecoils is the key to speedier quenching of heat treated parts at National Acme Co., machine tool manufacturer at Cleveland, Ohio. The Platecoils, through which cold water is circulated, are in one section of a divided 2,000 gallon tank. Oil is pumped from this section into the bottom of the quenching half of the tank. At the top, oil spills over a baffle back into the cooling section, setting up a continuous flow of oil, cooled as it passes over the Platecoils. Quenching operations are not interrupted to wait for oil to be cooled as they were when a horizontal tube bundle was used. Maintenance and repair, previously a difficult and time-consuming job also has been simplified. Investigate the possibilities for Tranter Platecoil savings and efficiency in your plant, today!



*For other examples and uses of Platecoil, write for Bulletin No. P60, a 12-company report.*

**PLATECOIL** Div. TRANTER MANUFACTURING, Inc., Lansing 4, Michigan

# Why a *Master*® truck is your best fork truck buy —

**1** Electric power gives 3 times longer life than gas trucks

**2** Lubricated-for-life — *never* needs greasing — absolutely no under truck adjustments

**3** ¼ the operating and maintenance cost of gas trucks

**4** Magnetic controls — no clutch . . . operate one lever to change speed and direction

**5** Standrive operating position for faster, safer, more comfortable forward and reverse operation

**6** Center control and one-step-high thru-truck aisle for easy mounting from either side

**7** Travel speed up to 6 MPH for maximum efficiency plus safety

**8** 40 FPM lift speed (with full load) 50 FPM lowering speed

**9** Capacities through 4000 lbs. (48" load length).

## L-S SPACEMASTER MODEL "E" ELECTRIC

IN ADDITION to the 9 points of superiority (above) of L-S SpaceMaster Electrics, there are many more reasons why Master Line Trucks are the best buy on the materials handling market.

Here's one. Lewis-Shepard offers *every type of truck made* — from lightweight two-wheelers to huge fork lifts. You get the extra convenience of "one-stop shopping" for *all* your truck needs. And you get all the benefits of standardizing on one make of equipment.

Here's another. Because your local L-S Representative has a *complete* line, he's in a better position to advise you . . . he's not biased in favor of one particular type of truck or design. So, for the most economical solution to your handling problems, buy from the only *complete* line of trucks on the market . . . the Lewis-Shepard Master Line! For catalogs describing SpaceMaster Model "E" Electrics or the complete Master Line, mail the coupon . . . *TODAY!*

**LEWIS-SHEPARD**

"The Master's Line"

158 Walnut St., Watertown 72, Mass.

Please send L-S SpaceMaster Model "E" Catalog No. 32
L-S Master Line Catalog

Name _____ Title _____

Company _____

Address _____

City _____ State _____

# CUT THE COST

## of "keeping things moving"

**Money "goes down the drain" quickly** when production slows or stops anywhere along the line. You can prevent production bottlenecks with *your own* "inside" telephone system!

The P-A-X Business Telephone System is a separate network of dial telephones—*owned* (not rented) to serve every part of your plant. Through P-A-X, executives and production supervisors can gather facts and issue instructions in seconds, to anticipate *and prevent* expensive roadblocks in production before they happen. P-A-X service is "person-to-person" contact in its fastest, most convenient form—reduces paperwork, saves time, *keeps things moving!*

Thousands of companies find that P-A-X is an investment that pays off, every working day. For an objective case study of P-A-X at work in a plant much like yours, write: Automatic Electric Sales Corporation, (HAymarket 1-4300), 1033 West Van Buren Street, Chicago 7, Illinois. In Canada: Automatic Electric Sales (Canada) Ltd., Toronto. *Offices in principal cities.*

*Learn how a leading manufacturer uses P-A-X to improve production control--and cut costs. Write for a copy of this illustrated case study today.*

AUTOMATIC ELECTRIC

ORIGINATORS OF THE AUTOMATIC TELEPHONE

# Norgren...the most complete line of AIR LINE LUBRICATORS

## FOR BETTER PERFORMANCE • LONGER LIFE • LESS MAINTENANCE COSTS

**79 MODELS...3 OZ. TO 5 GAL. OIL CAPACITIES...⅛" TO 1½" PIPE SIZES**

### MICRO-FOG LUBRICATORS *for Tools, Cylinders and Other Air Equipment*

**½ PT. OIL CAPACITY**
***Constant Oil Level***
5 pipe sizes, ¼" to 1" incl.
Replaceable, transparent oil reservoir. Series 30-41-LC.

***Without Constant Oil Level***
5 pipe sizes, ¼" to 1" incl.
Replaceable, transparent oil reservoir. Series 30-41-L.

**⅓ PT. OIL CAPACITY**
¼" and ⅜" pipe sizes.
Replaceable, transparent oil reservoir. Series 30-40-L.

**1 QT. OIL CAPACITY**
5 pipe sizes, ¼" to 1" incl.
Replaceable metal reservoir.
Constant Oil Level.
Series S3406-LC.

**1¾ GAL. OIL CAPACITY**
5 pipe sizes, ¼" to 1" incl.
Replaceable, metal oil reservoir.
Constant Oil Level.
Series X3400-LC.

**4½ GAL. OIL CAPACITY**
5 pipe sizes, ¼" to 1" incl.
Replaceable, metal oil reservoir.
Constant Oil Level.
Series Y3400-LC.

### MICRO-FOG BEARING LUBRICATORS *of 32, 200, 300, 1000 bearing inch capacities*

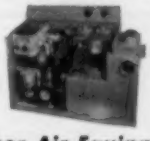
**⅓ PT. OIL CAPACITY**
Model 30-40-2S—¼" pipe size.
32 bearing inch capacity.

**1 QT. OIL CAPACITY**
Model S3406-2S—¼" pipe size.
32 bearing inch capacity.
Model S3406-6S—¾" pipe size.
200 bearing inch capacity.
Model S3406-8S—1" pipe size.
300 bearing inch capacity.

**½ PT. OIL CAPACITY**
Model 30-41-2S—¼" pipe size.
32 bearing inch capacity.

**1¾ GAL. OIL CAPACITY**
Model X3400-2S—¼" pipe size.
32 bearing inch capacity.
Model X3400-6S—¾" pipe size.
200 bearing inch capacity.
Model X3400-8S—1" pipe size.
300 bearing inch capacity.

**4½ GAL. OIL CAPACITY**
Model Y3400-2S—¼" pipe size.
32 bearing inch capacity.
Model Y3400-6S—¾" pipe size.
200 bearing inch capacity.
Model Y3400-8S—1" pipe size.
300 bearing inch capacity.

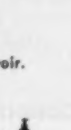


Model 33AB-4
½" Inlet, 2" Outlets.
1000 bearing inch capacity.

### OIL-FOG LUBRICATORS *for Tools, Cylinders and other Air Equipment*

**3 OZ. OIL CAPACITY**
¼" pipe size.
Permanent, metal oil reservoir.
Model 399LB-2.

**⅓ PT. OIL CAPACITY**
¼" and ⅜" pipe sizes.
Replaceable, transparent oil reservoir.
Reversible. Series O-40.

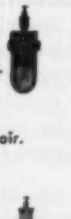


**1 QT. OIL CAPACITY**
5 pipe sizes, ¼" to 1" inclusive.
Replaceable, metal oil reservoir.
Reversible.
Series S406.

1¼" and 1½" pipe sizes.
Permanent, metal oil reservoir.
Series 406.

**5 GAL. OIL CAPACITY**
5 pipe sizes, ¼" to 1" inclusive.
Replaceable, metal oil reservoir.
Reversible.
Series Y400 and Y402.

1¼" and 1½" pipe sizes.
Replaceable, metal oil reservoir.
Series Y408.



**2 QT. OIL CAPACITY**
5 pipe sizes, ½" to 1½" inclusive.
Permanent, metal oil reservoir.
Series 408.

¼" pipe size.
Permanent, metal oil reservoir.
Model 399-2.

**½ PT. OIL CAPACITY**
5 pipe sizes, ¼" to 1" inclusive.
Replaceable, transparent oil reservoir.
Reversible.
Series O-41 and O-42.

5 pipe sizes, ¼" to 1" inclusive.
Replaceable, metal oil reservoir.
Reversible.
Series SO-41 and SO-42.

**2 GAL. OIL CAPACITY**
5 pipe sizes, ¼" to 1" inclusive.
Replaceable, metal oil reservoir.
Reversible.
Series X400 and X402.

1¼" and 1½" pipe sizes.
Replaceable, metal oil reservoir.
Series X406.

**LUBRO-CONTROL UNIT**

showing typical combination of Micro-Fog Lubricator with Automatic-Drain Filter and Air-Pressure Regulator.

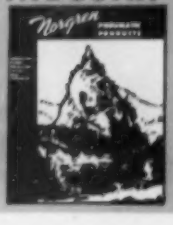
## OVER 1,100,000 NORGREN LUBRICATORS PUT TO USE IN INDUSTRY

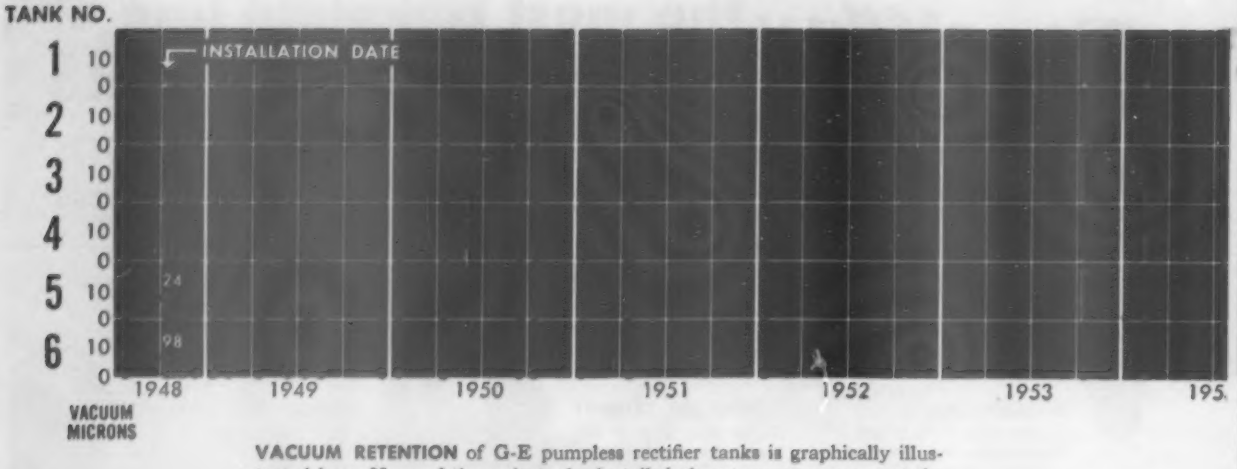
C. A. Norgren CO.
3421 So. Elati, Englewood, Colo.

Phone the Norgren representative listed in telephone directory classified section under "Norgren Pneumatic Products"... or

**WRITE FOR CATALOG** →

showing latest developments in Micro-Fog lubrication and giving data on Norgren's complete line of lubricators, air filters, pressure regulators, valves, hose assemblies.






**VACUUM RETENTION** of G-E pumpless rectifier tanks is graphically illustrated here. None of these six tanks, installed almost seven years ago at the Buffalo plant of the Wickwire Spencer Steel Division of the Colorado Fuel and Iron Corporation, has ever required maintenance. This endurance test is conclusive proof that the G-E pumpless tank is an outstanding performer.

# Not one cent has ever been spent for repairs on a G-E pumpless rectifier tank

Since 1948—when the first General Electric pumpless rectifier unit was installed—not a single customer anywhere in the country has paid out a penny for vacuum tank repair. And this is only a start. G-E engineers estimate a much longer life for this equipment. Here's why:

**"PERMANENTLY-SEALED" TANKS,** manufactured under almost antiseptic conditions, eliminate the need for a pumping system. This, in turn, eliminates such problems as mercury migration between tanks and the possibility of shutdown due to vacuum-system failure.

**SUPERIOR MANUFACTURING AND TESTING** methods have made this exclusive sealed-tank design possible. Tanks are assembled in a special air-conditioned room, then baked, pumped-down and sealed to assure the best possible vacuum. To check the possibility of even the most minute leak, tanks are pumped in a helium atmosphere and the exhaust is examined by a mass spectrometer leak detector capable of detecting one part of helium in 100,000 parts of normal air.

**FACTORY RECONDITIONING** of tanks, should it be necessary, is a relatively inexpensive process and relieves you of tank maintenance problems. The tank is reconditioned under the same controlled factory conditions described above and returned ready for more years of service. You can operate with a spare tank during reconditioning.

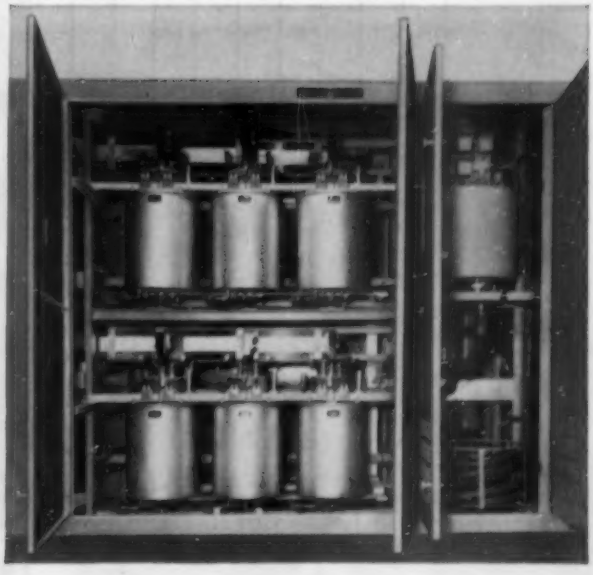
**ADD TO THIS** the highly efficient operation of mercury-arc conversion and you'll find that G-E pumpless rectifiers are the most economical way to get d-c power in the 750-kw range and above. For the whole story, contact your nearest G-E Apparatus Sales Representative or write for bulletin GEA-5689. General Electric Company, Schenectady 5, New York. 524-2

*Progress Is Our Most Important Product*

GENERAL ELECTRIC

**ASSEMBLY ROOM** for pumpless-rectifier tanks is clean, air-conditioned to help prevent contamination. After assembly, testing with mass spectrometer leak detector assures that tanks are free from even the most minute leaks.

**LONG LIFE AND LOW MAINTENANCE** are the payoff when these tanks are put into service. The six-tank rectifier compartment shown here is furnished with transformer and associated a-c and d-c switchgear—a completely metal-enclosed d-c substation which requires a minimum of floor space.



GENERAL ELECTRIC

*At the Show...*

# See Stainless Bored at Better than 7″ per Minute!

*on the New LeBlond-Carlstedt Rapid Borer*

With the new LeBlond-Carlstedt Rapid Borer, you can bore, trepan or counterbore holes *3 to 8 times faster than by the conventional D-bit method!* We'll prove this at the Machine Tool Show. You'll see a 1⅛" hole bored in solid Stainless 303 at better than 7" per minute. We'll bore 4140, C-1141 and 6150 even faster!

The Rapid Borer was developed expressly to accommodate revolutionary new tooling which cuts at very high speed with excellent accuracy and finish. Cutting oil is forced between the boring bar and hole wall forming a continuous bearing. It flushes back through a hole in the boring head and bar, carrying away the chips as it goes. Chip form is controlled both by tool angles and proper feed and speed combinations; thus tool faces are kept clean and chip passage clear. Cutter design produces balanced cutting pressures thereby controlling concentricity.

This new tooling requires a machine with the following characteristics, all of which are incorporated in the Rapid Borer's design:

*High spindle horsepower*

*Ample rigidity throughout*

*Complete absence of vibration at all speeds*

*Infinitely-variable feeds (up to 38" per minute), independent of speeds, while running under load*

*Final drive to spindle through belts*

*Large volume of cutting oil*

Basically, the Rapid Borer is suited to work that is symmetrical for balance in rotation —round, square, octagonal, tapered or stepped. A wide variety of hole diameters and depths as well as work sizes can be accommodated.

*Tell us about the holes you'd like to produce faster.* Large holes or small. If the Rapid Borer can handle the job, we'll show you how to produce them faster than ever before.

## *Like to see your own materials bored at the show?*

**Just prepare sample bars of the materials you are now boring, or intend to bore. Make them according to the drawing here. Bring them to the Show and we'll bore them for you on the Rapid Borer.**

See it at the show. No. 1313—dead center of the new exhibition hall.

*...cut with confidence*

The R.K.LeBlond Machine Tool Company

Cincinnati 8, Ohio

*World's largest builder of a complete line of lathes for more than 68 years*

LeBLOND of Cincinnati

# In Industry...

# DELCO

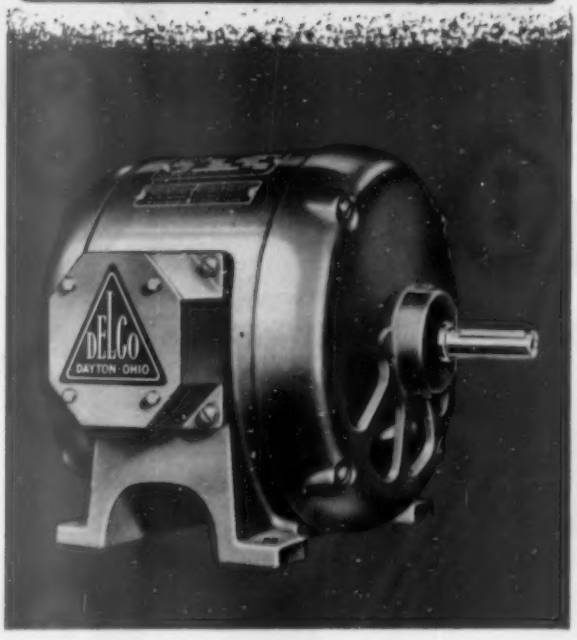
## preferred

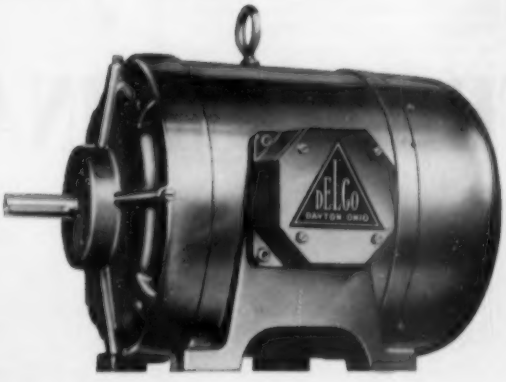
Delco integral motors at work on heavy industrial grinder.

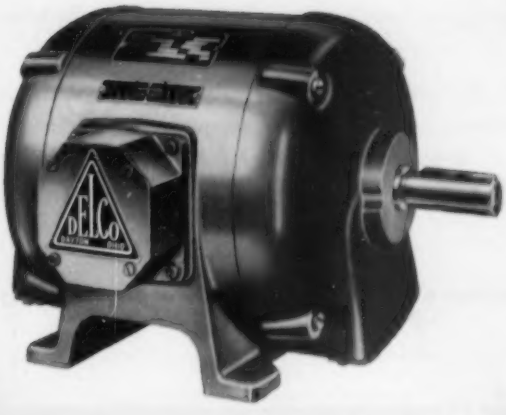
From fractionals through large integrals, Delco electric motors are designed specifically to meet *your* requirements. They assure top performance and dependability on any job.

Delco engineers work closely with *your* engineers to fit each motor to the particular job you want it to do. Each Delco motor then is built to one rigid quality standard, and subjected to exhaustive tests all along the production line.

★ *See Delco electric motor national advertising in The Saturday Evening Post for the story of the full Delco electric motor line.*







With this quality control, Delco motors perform better, stand up longer, cost less to maintain.

That's why, for almost every industrial need and product application, you will find Delco preferred. And wherever Delco motors go to work, Delco parts and service aren't far away.

Your request for further information will receive a prompt reply.

GM GENERAL MOTORS DELCO

**DELCO *Electric* MOTORS**

DELCO PRODUCTS, DIVISION OF GENERAL MOTORS, DAYTON, OHIO

*Proved best by Performance!*

# JONES & LAMSON offers you THIS COMBINATION

GREATER SAVINGS

FINEST MACHINES

EASIEST PROCUREMENT

*Modern machine tools* that produce greater work accuracy at lower costs than ever before.
*Scientific research* in machining methods, metallurgy, tool geometry and inspection procedures.
*Realistic Procurement* — you have your choice of several sound financing methods, plus the advantages of new tax laws with more equitable write-offs.

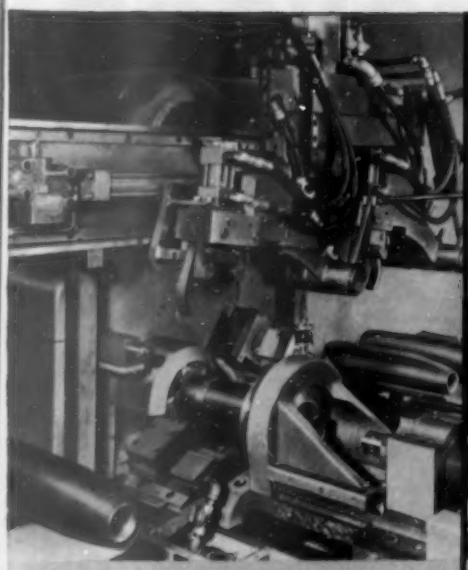
From initial survey of your production requirements right through to delivery and installation of new equipment, every phase of J&L's Replacement Program service is complete, competent and reliable.

***The man who needs a machine tool . . . is already paying for it.***

JONES & LAMSON MACHINE COMPANY

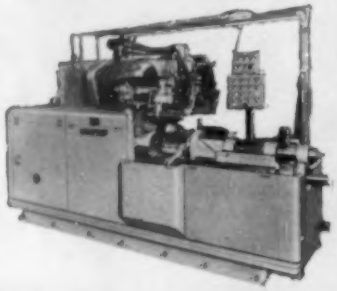
505 Clinton St., Dept. 710, Springfield, Vt., U. S. A.

UNIVERSAL TURRET LATHES • FAY AUTOMATIC LATHES
AUTOMATIC DOUBLE-END MILLING & CENTERING MACHINES • AUTOMATIC THREAD & FORM GRINDERS
OPTICAL COMPARATORS • AUTOMATIC OPENING THREADING DIES & CHASERS



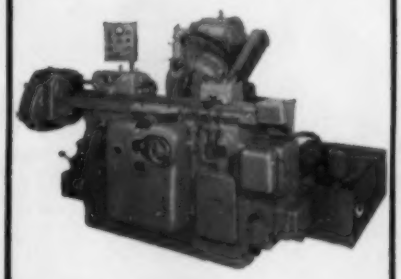
## AUTOMATIC HANDLING

Completely automatic operation of this Fay Automatic lathe, including *loading, machining, chip and coolant disposal* and *unloading*, ups production to 180 pcs. per hour at 100% efficiency in the machining of these shells.



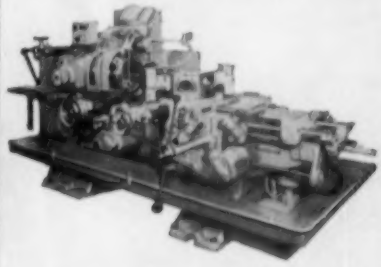
## NEW METHODS

By grinding this worm (stock removal .1235″ — one pass) on a J&L 6 x 36″ Automatic Thread Grinder, production is increased 160% per machine over previous methods.



## VERSATILE TOOLING

High production methods of tooling for automatic lathes were simplified and applied to three 7B J&L Universal Turret Lathes. Inner and outer Ball Bearing Races are produced on the same machines. Set up time from one lot to the next does not exceed fifteen to twenty minutes per machine.



Jones & Lamson's unique Procurement Plan offers you a choice of methods for procuring new, high-efficiency equipment. You may buy outright; pay-from-productivity on a variety of bases, at interest rates of 3¼% and lower (add-on); or you may use any of several variations of a truly flexible lease plan.

## MACHINE TOOL DIVISION

**Valuable information is yours for the asking. Simply fill in the coupon below, *clip it to your letterhead*, and mail.**

**Jones & Lamson Machine Company**
**585 Clinton St., Dept. 710,**
**Springfield, Vermont, U. S. A.**

Please send me the Jones & Lamson *Machine Tool Replacement Information Kit.*

*Name*.....

*Title*.....

# LET'S TAKE A CLOSE

# LOOK AT LP-GAS . . .

## Here are the advantages:

**LONGER ENGINE LIFE!**
LP-Gas burns clean, with nearly perfect combustion, leaves no carbon or lead deposits—does not dilute cylinder lubricant. Engines have run up to 8,000 hours before major overhaul was necessary.

**LOWER MAINTENANCE!**
LPG is dry—does not dilute crankcase oil, foul spark plugs. You get better lubrication—need fewer oil changes, fewer tune-ups. You can get 5 to 8 times longer oil life.

**LOWER FUEL COSTS!**
In many areas LP-Gas is 3 to 7 cents per gallon cheaper than gasoline. Estimates show that for a 40-hour week, a 10-truck fleet could save from $30 to $70 in fuel alone.

**NO OBJECTIONAL EXHAUST FUMES!**
LPG burns clean, reduces fumes. Ideal for use in warehouses and other enclosed industrial areas.

**GREATER OPERATING EFFICIENCY!**
You get quieter, smoother operation, higher octane fuel, faster refueling (only 3 minutes to change tanks), much less downtime.

## What about safety?

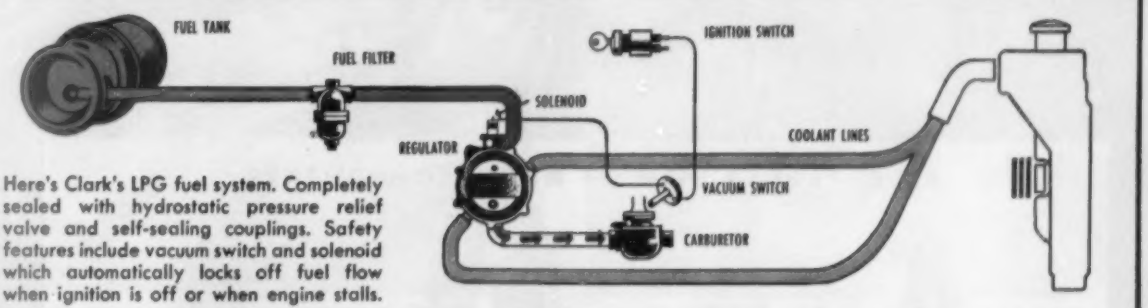
Clark factory installed LPG carburetion systems are fully approved for safety by Underwriters' Laboratories.

## What's the best system?

Clark's factory installed LPG system is specially engineered from fuel tank to exhaust pipe. Engine is designed for maximum LPG benefits, has higher compression ratio, cold manifold, stellite valves and seats, positive valve rotators. Fuel system is sealed and designed for complete fuel combustion . . . top economy.

## What's available?

Clark offers a complete line of U-L approved LP-Gas trucks in capacities from 2000 to 7000 lbs.




Here's Clark's LPG fuel system. Completely sealed with hydrostatic pressure relief valve and self-sealing couplings. Safety features include vacuum switch and solenoid which automatically locks off fuel flow when ignition is off or when engine stalls.

Industrial Truck Division
**CLARK EQUIPMENT COMPANY**
Battle Creek 12, Michigan

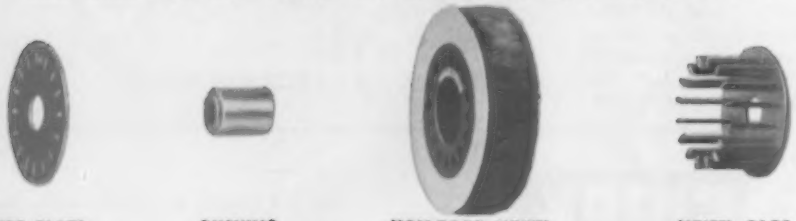
**CLARK® EQUIPMENT**

**For full details on Clark's advanced LPG system, tear out this coupon and attach it to your letterhead. No obligation, of course.**

**A BETTER BUY WITH LOCAL SUPPLY—*Genuine Clark Parts***

# Behr-Manning pioneers an

## AN EXPLODED VIEW OF WHEEL COMPONENTS...



SIDE PLATE | BUSHING | KON-TOOR WHEEL | WHEEL CAGE

The KON-TOOR WHEEL is constructed of numerous segments of double-faced abrasives and is available in face widths 2" to 7" inclusive – Flexible or stiff construction. Multiple wheels can be used for widths over 7".

*For the newest in coated abrasives...watch BEHR-MANNING!*

# entirely new concept in polishing!

## ...the ALL coated abrasive KON-TOOR® WHEEL

### CAN BE SHAPED TO CONTOUR

Note how the KON-TOOR WHEEL hugs the radius of this stainless steel cooking utensil.

### PRODUCES FINER FINISHES

An intricate radius on a pressure cooker cover gets polished by a 2" face KON-TOOR WHEEL.

### MINIMUM LUBRICATION REQUIRED

It cuts cooler all the way – A 2" face KON-TOOR WHEEL polishing a drawn steel coffee pot.

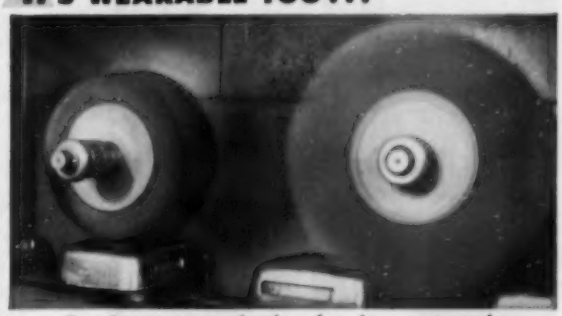
### CUTS FINISHING COSTS

Polishing production soars with the KON-TOOR WHEEL on jobs like this aluminum stamping.

### EASY TO USE

Complicated conversion factors are eliminated. The KON-TOOR WHEEL is easily adapted to standard lathes and work-holding fixtures.

### IT'S WEARABLE TOO!!!



Stands up to production for days and weeks instead of hours – note wheel at left still producing after days on the job.

● For details, contact your local Behr-Manning Field Engineer, or write today to Behr-Manning, Troy, N.Y., Dept. FM-8.

In Canada: Behr-Manning (Canada) Ltd., Brantford.
For Export: Norton Behr-Manning Overseas Inc., New Rochelle, N.Y., U.S.A.

G-8

BEHR-MANNING® division of NORTON Company

▲ COATED ABRASIVES
▲ SHARPENING STONES
▲ PRESSURE SENSITIVE TAPES

FIRE TRAINING SCHOOL. Here at Marinette your key plant personnel will receive special training in the proper use of every type of fire equipment. They will learn the basic techniques for fighting every kind of fire. This is the best equipped private fire training school in the nation.

# There is no need to accept less than Ansul's complete fire protection program!

TRAINING DEMONSTRATIONS. Our fire fighting experts provide training in the use of Ansul equipment at your plant.

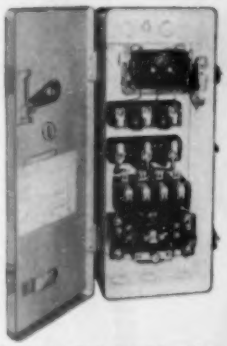
ALL ANSUL EQUIPMENT is backed by a five year warranty, your assurance of fast, effective fire protection.

Experience can be a grim teacher. It has taught many a businessman that you need a *complete* fire protection program to guard against ruinous fire damage. You need *fast, effective equipment*, plus *trained personnel* to man that equipment. Ansul offers *both* and at no extra cost. Get in touch with the Ansul man, he has the story about *complete* fire protection.

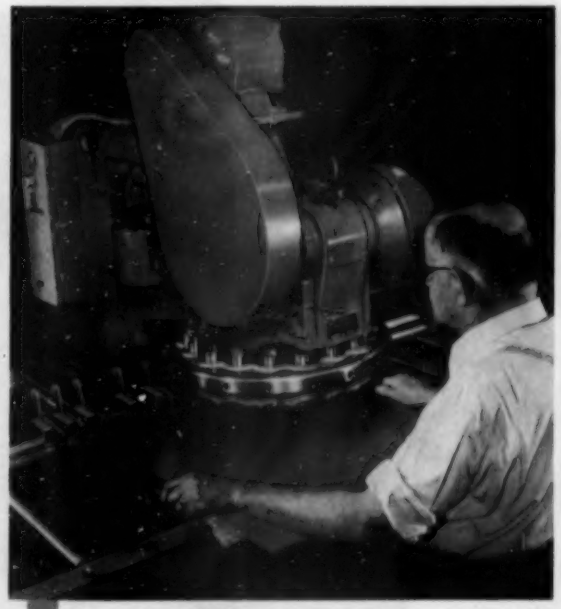
## Call the Ansul Man!

Get in touch with your local Ansul man through the "yellow pages" or write ANSUL CHEMICAL COMPANY, Dept. F-72, Fire Equipment Division, Marinette, Wisc. Write Ansul for your copy of new Fire Equipment Catalog.

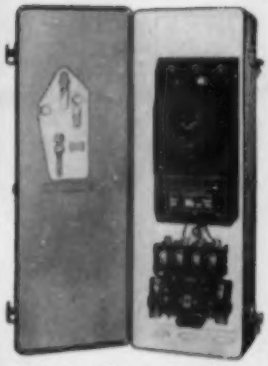
ANSUL



Bulletin 712 combination starter with manual, fused disconnect and solenoid starter in NEMA Type 1 general purpose enclosure



Weidemann turret punch press equipped with Allen-Bradley Bulletin 712 combination starter



Bulletin 713 combination starter with I-T-E circuit breaker and solenoid starter in NEMA Type 1 general purpose enclosure

# BULLETIN 712-713 COMBINATION STARTERS

## MAKE MORE COMPACT and SAFER CONTROL INSTALLATIONS

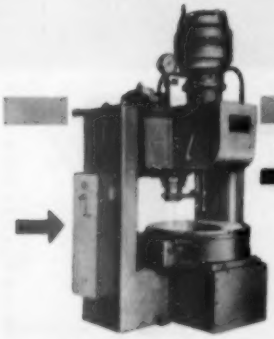
Many motorized machine installations call for a manual disconnect or circuit breaker ahead of the magnetic starter. In such cases, do not order the two units in separate enclosures . . . specify Allen-Bradley combination starters, which have both units in ONE enclosure.

The cost—taking installation time into consideration—is usually less. The combination starter is "safe" for the operator. Cabinet cannot be opened unless disconnect lever is in OFF position. Starter and fuses are then "dead."

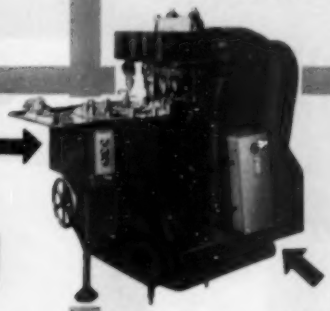
The magnetic starters in these combination starters are Allen-Bradley Bulletin 709 solenoid starters with double break, silver alloy contacts that need no maintenance. Thermal relays give continuously reliable overload protection.

Send for Bulletin 712-713.

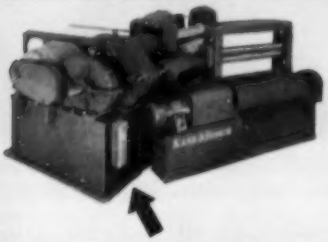
A-B comb. starter on CELAB 50 kw. selenium rectifier



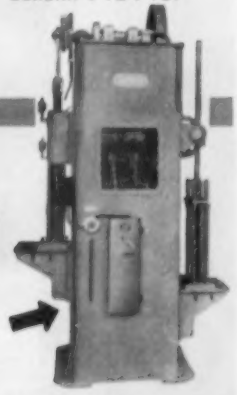
A-B combination starter on Loomis 100 ton hydraulic press



A-B comb. starter on Globe multiple tapping machine



A-B comb. starter on Kane & Roach slitting machine



A-B combination starter on Link spring fatigue tester

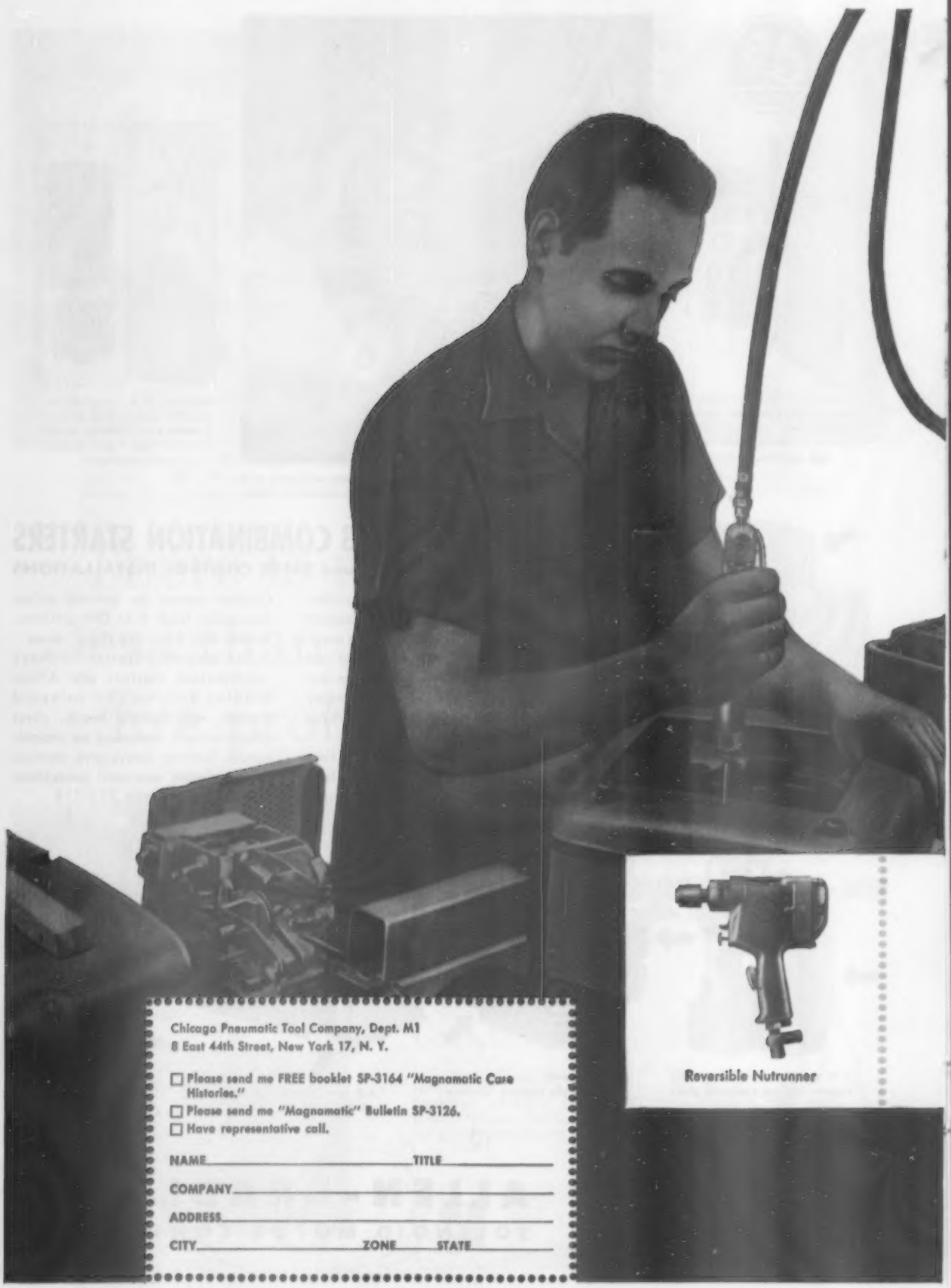
Allen-Bradley Co.
1321 S. First St.
Milwaukee 4, Wisconsin

In Canada—
Allen-Bradley Canada Ltd.
Galt, Ont.

**ALLEN-BRADLEY**

**SOLENOID MOTOR CONTROL**

QUALITY





Reversible Nutrunner

Chicago Pneumatic Tool Company, Dept. M1
8 East 44th Street, New York 17, N. Y.

☐ Please send me FREE booklet SP-3164 "Magnamatic Case Histories."
☐ Please send me "Magnamatic" Bulletin SP-3126.
☐ Have representative call.

NAME_____ TITLE_____

COMPANY_____

ADDRESS_____

CITY_____ ZONE_____ STATE_____

# NEW! Controlled-Torque power screwdriver-nutrunner

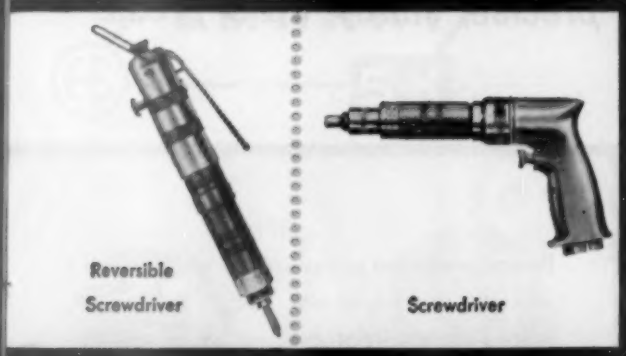
## the revolutionary CP "Magnamatic" with the one-shot clutch

An air-driven torque screwdriver-nutrunner that can be preset to run one screw or thousands* to specified torque . . . that's the CP One-Shot "Magnamatic."

In design and operation "Magnamatic" is entirely new, but thoroughly proved in more than eighteen months of field testing and operation on production lines:

—an Alnico magnetic One-Shot clutch, adjustable to specified torques, disengages *completely* the instant the fastener is driven to the desired tightness. The clutch does not impact or ratchet—the irritating "buzz" of conventional tools is eliminated. Inexperienced or fatigued operators can't burr screw heads, strip threads, shear fasteners, or damage work surfaces. It is impossible to overdrive a nut or screw with a CP "Magnamatic" no matter how long the tool is held on the work.

A complete line of One-Shot "Magnamatic" Screwdrivers, reversible and nonreversible types, in capacities from #4 screws to $\frac{3}{8}$" bolt size, is now in production.




*On the assembly line of a midwestern manufacturer, an operator is running 16,000 #6-32 screws per day with "Magnamatic" to a critical torque specification.

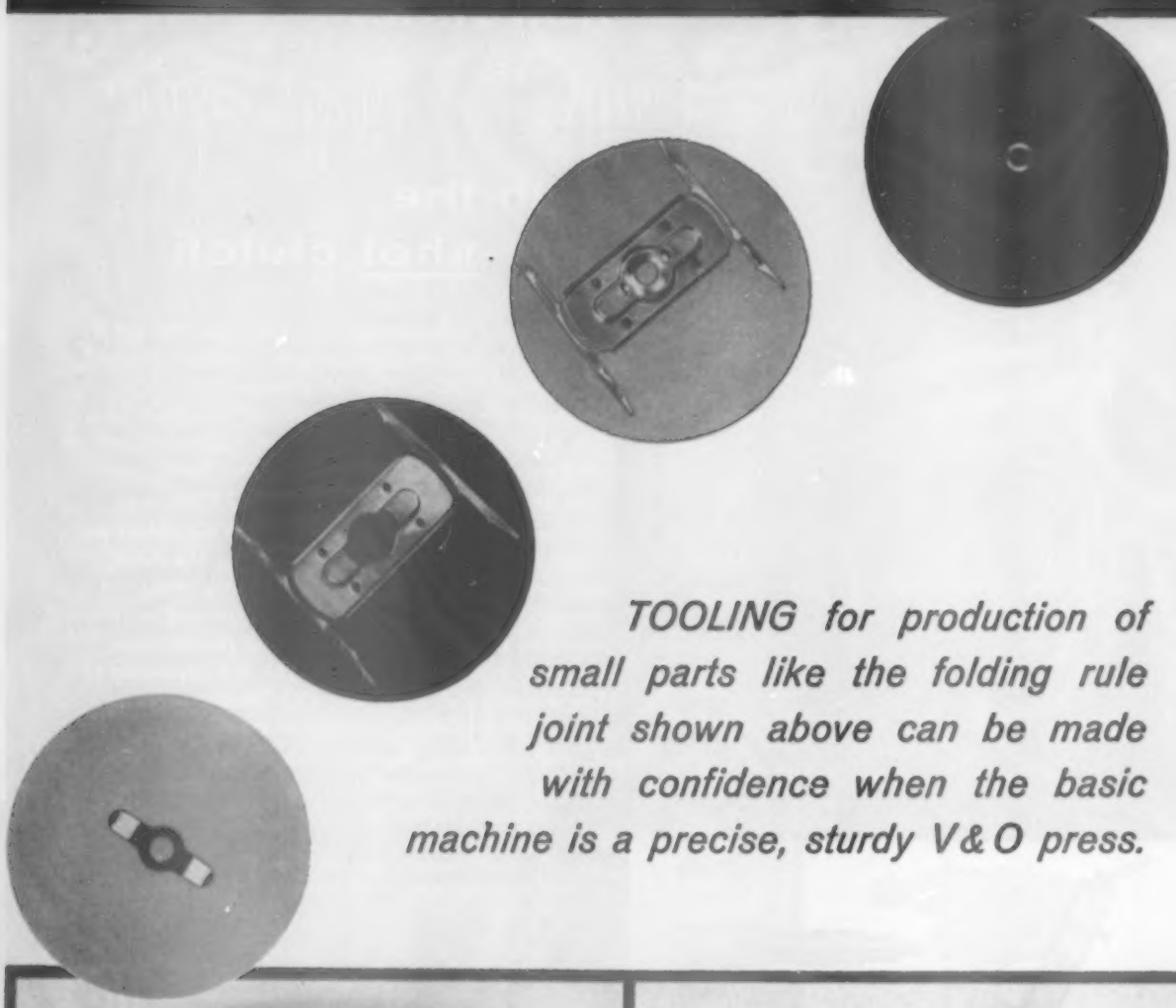
ONE-SHOT "MAGNAMATIC" SCREWDRIVER-NUTRUNNER

- can be preset to drive fasteners to specified torques.
- maintains the selected torque setting indefinitely.
- has no clutch jaw wear.
- disengages the instant the fastener is run to desired tightness.
- eliminates the need for skilled operators.
- eliminates stripped threads, sheared fasteners, surface damages.
- prolongs service life of screw bits.

Chicago Pneumatic

PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES • ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES

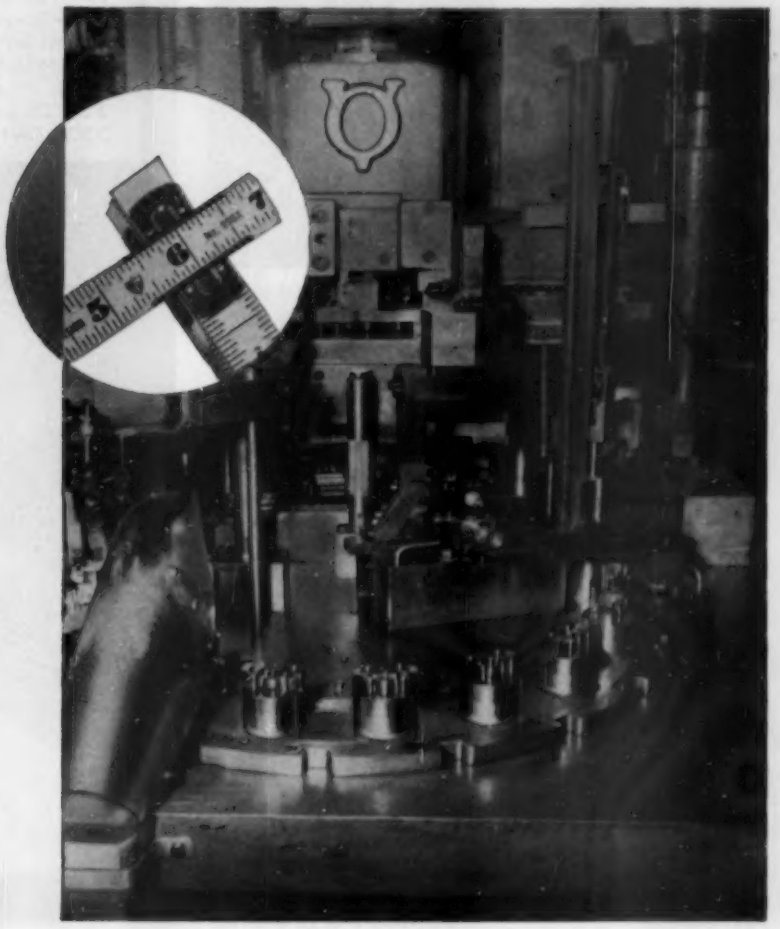
# How to mechanize with change in mind



*TOOLING for production of small parts like the folding rule joint shown above can be made with confidence when the basic machine is a precise, sturdy V&O press.*

**Package handling** equipment by Standard-Knapp features adaptability. Case sealing unit, for example, self-adjusts to different sizes of shipping cases.

**Demand production** of metal stampings is practical with Henry & Wright Dieing Machines. Their high speed and versatility assures quick completion of simple or tricky parts.



EMHART

S-K

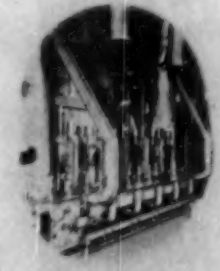
EMHART MFG. CO., HARTFORD 2, CONNECTICUT

Western representative: MAILLER SEARLES, INC., Los Angeles and San Francisco

## *Only the best is good enough*

***Because Emhart machines will do more than one thing, you can mechanize operations and retain adaptability to change. Our condensed catalog of over 275 machines tells more.***

**By easy changes** Hartford-Empire forming machines produce bottles and jars ranging from the smallest to the largest at high speeds and low cost.



EMHART MFG. CO.
HARTFORD 2, CONN.

Please send your condensed catalog of Emhart machines.

Name_____

Company_____

Street address_____

City_____ Zone____ State_____

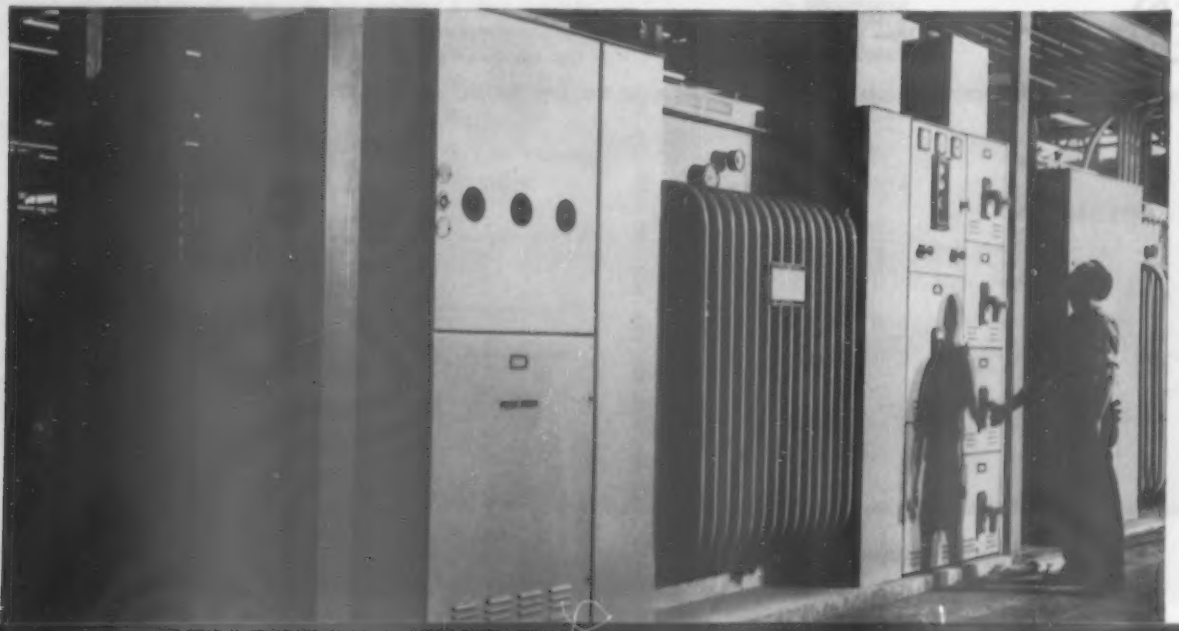
**1. INDIVIDUAL AIR CIRCUIT BREAKERS** provide the best protection for control or switching. Particularly suitable for motor control, they can't be "single-phased." Both drawout switchgear and individual breakers have racking device to simplify removal. Ask for Bulletin GEA-5915.

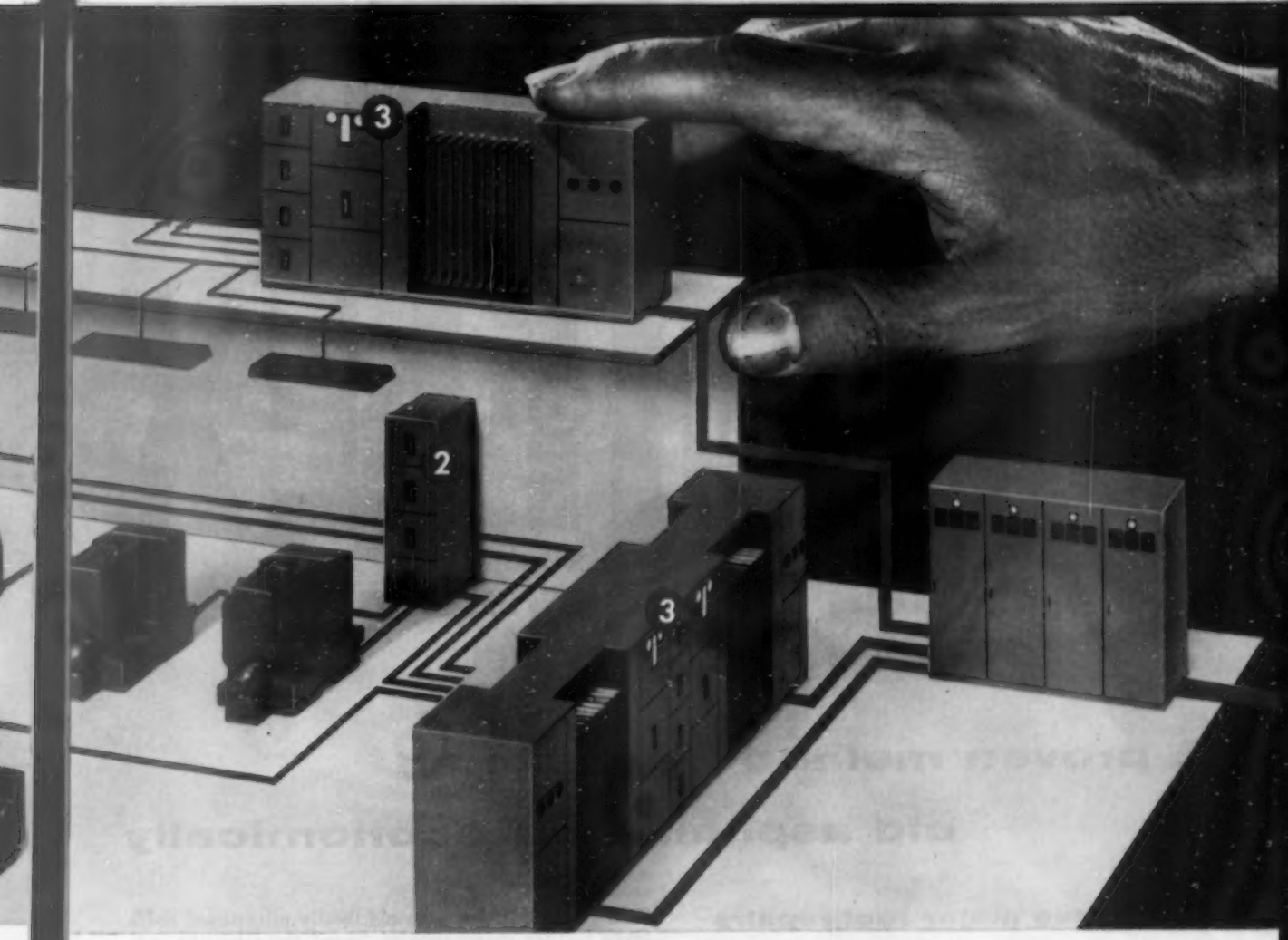
**2. DRAWOUT SWITCHGEAR** provides a convenient and economical way to locate a number of breakers in one out-of-the-way spot. This conserves valuable floor space and centralizes control. ***These entire equipments*** have been design tested up to maximum short-circuit ratings. Bulletin GEA-5916 gives details.

**CAN YOU AFFORD A POWER FAILURE AT ANY POINT IN YOUR PLANT?** G-E low-voltage switchgear—individual breakers (1) drawout switchgear (2) and load-center substations (3)—is designed to provide maximum protection up to full interrupting rating. This ability is backed up by DESIGN TESTING OF COMPLETE EQUIPMENTS IN THE SWITCHGEAR DEVELOPMENT LAB.

# Now... more protection for less cost

**3. LOAD-CENTER SUBSTATIONS** bring power close to load for most economical distribution. Air circuit breakers are properly co-ordinated with transformer capacity to give optimum protection. For details ask for Bulletin GEA-3592.






# at all these vital points...

**YOU CAN'T AFFORD ANYTHING LESS THAN THE BEST WITH THE COST OF SWITCHGEAR REDUCED UP TO 33% BY THE INCREASE IN G-E AIR CIRCUIT BREAKER INTERRUPTING RATINGS**

**THE COST OF POWER DISTRIBUTION SYSTEM PROTECTION IS DOWN**—if you are building or modernizing, you can get maximum protection with the right switchgear at about the same price you would have paid for equipment *barely adequate.* You can't afford to let another day go by without being positive that you have complete protection at every vital point in your electrical system. If you have a power system over ten years old, check it now for possible increased short-circuit capacities. Don't risk even a partial power failure when modernizing is so economical.

**HERE'S HOW YOU CAN SAVE** up to 33% with the recent increase in G-E air circuit breaker interrupting ratings. These increases—25 to 50% for low-voltage applications—permit the use of smaller, and less expensive, breakers at many points in your system . . . in load-center unit substations, drawout switchgear and individually mounted breakers.

**CHECK THE PRICE** on G-E low-voltage switchgear for your system. You'll be surprised at how favorably it compares with prices on equipment that doesn't offer the same reliability of operation, ease of installation and maintenance, and high degree of safety for personnel.

**FOR COMPLETE INFORMATION** contact your General Electric Apparatus Sales Representative or write to General Electric Company, Schenectady 5, N. Y. 523-3

*Progress Is Our Most Important Product*

**GENERAL ELECTRIC**

# Carey

# FIBERFLEX

## glass roof system

## A proven method for restoring old asphalt roofs economically

- **Eliminates major roof repairs**
- **Outlasts other types of roofing**
- **Simple and easy to apply**
- **Packaged ready for quick use**

Add years of life to your old, badly alligatored roofs. Save further major repairs. Speed the job with ordinary labor and without costly equipment. How? With the new, long-lasting, durable Carey FIBERFLEX GLASS ROOF SYSTEM.

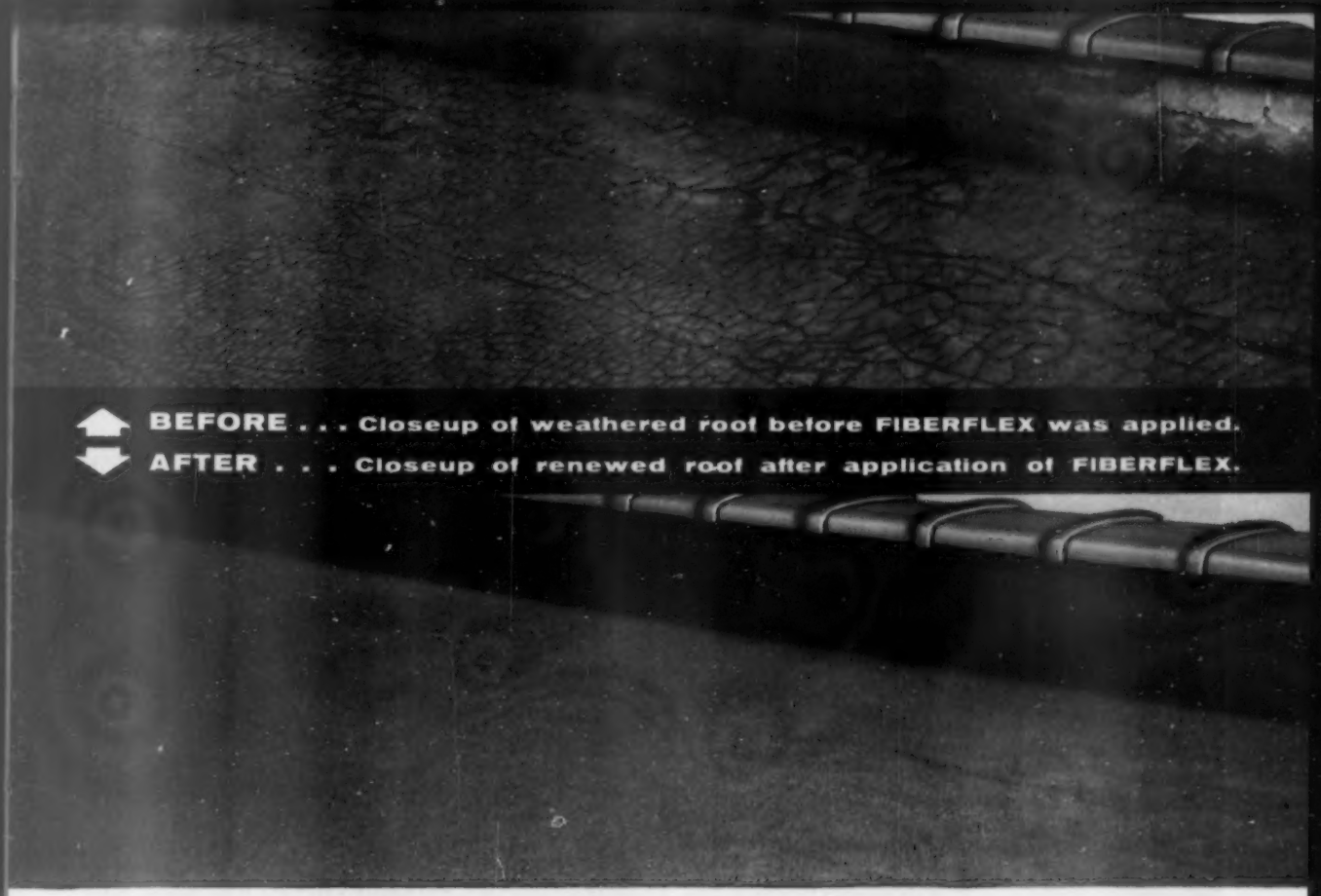
Your old roofs can be coated and recoated with this durable, elastic reinforcement. You can *save* weathered and cracked roofs still too good to replace with more costly new roofs.

## Application Details . . .

**1.** Remove dirt and debris from roof. Then flush with water—or prime with Carey Asphalt Primer. A clean surface is most important to obtain bond of new roofing to old.

**2.** If necessary, the old roof is patched and repaired in accordance with good roofing practices. Skilled labor is unnecessary. You don't need special equipment, either.

**3.** Flashing walls are covered with Emulsion before roof itself is treated. While Emulsion is still wet, Glass Mat is embedded in it; this surface is then brushed or sprayed with Emulsion.



**BEFORE . . .** Closeup of weathered roof before FIBERFLEX was applied.

**AFTER . . .** Closeup of renewed roof after application of FIBERFLEX.

FIBERFLEX is a tough topping of special Carey Emulsion, reinforced with a layer of lightweight Glass Mat. *A Glass Mat that weighs only 1/7 as much as felt!* Quickly, it covers alligatored areas . . . provides a uniform surface to receive the top coating of FIBERFLEX liquid. It "welds" snugly to the surface, seals out moisture . . . *out-performs, out-lasts* other types of roof coating.

Carey is the first manufacturer of roofing products to give you a *complete* roofing "package" of this kind. Your Carey Industrial Sales Engineer will show you how FIBERFLEX can save you the cost of a new roof —cut down on repairs and maintenance. Use coupon below to request his services, without obligation, and free literature.

Better Products for Industry, Farm and Home Since 1873

**Carey**

Flat Asbestos-Cement Sheets • Built-up Roofing • Bonded Roofs • Super-Light 85% Magnesia Insulation • Careyduct • Asphalt Plank • Asphalt Paints and Coatings • Fiberflex Glass Roof System

**4.** Roof proper is treated in same manner—first a strip of Emulsion, into which is rolled the Glass Mat. Then, another spraying of Emulsion for the finish coat.

**5.** Each strip is overlapped 2" with adjoining strip. Procedure is carried out until entire roof is covered. Application is fast and easy; requires no skilled labor.

**The Philip Carey Mfg. Company**
Lockland, Cincinnati 15, Ohio Dept. FMM-8

☐ Please send me free folder and full details on how the FIBERFLEX GLASS ROOF SYSTEM saves year-after-year costly roof maintenance.

☐ Have a Carey Industrial Sales Engineer call without obligation.

Name_____

Firm_____

Address_____

City_____ Zone____ State_____

# Which chain problem is yours?

## Your Republic Chain Distributor can come up with the answer...

Is your problem one of corrosion-resistance, such as that solved by the Republic Chain application illustrated at right? Or is hoisting, hauling, holding, towing, bundling? Or is it a selection of chain for use with the product you make?

In any case, you'll want to be sure of your chain-maker. Republic backs its chain distributors with these vital services:

**COMPLETE LINE**—Your Republic Chain Distributor offers a complete line of every type and size of welded and weldless chain, chain slings, attachments and accessories in all standard and special carbon, alloy and stainless steel analyses.

**DEPENDABLE DELIVERY AND SERVICE**—His own stocks of chain are backed by Republic Round Chain plants and warehouses strategically located in principal cities from coast to coast. You get exactly the chain you need in a hurry, eliminating costly downtime and delays.

**ENGINEERING**—He has at his disposal the services of Republic's Field Engineering Department—staffed by competent chain engineers thoroughly trained to handle all types of chain problems.

**QUALITY PRODUCTS**—When you buy chain from your Republic Distributor, you're assured of a top-quality product in every sense of the word. Republic uses its own ores, makes its own steels, rolls its own bars, draws its own wire. In fact, Republic is the only chain producer who can control quality at every stage of production from raw material to finished product.

**RESEARCH**—Your Republic Chain Distributor offers you further assurance of top quality because he's backed by a research program devoted to the continuous task of improving chain. Republic research is always at work, from selection of materials through forming, welding, heat treating to the final inspection of the finished chain.

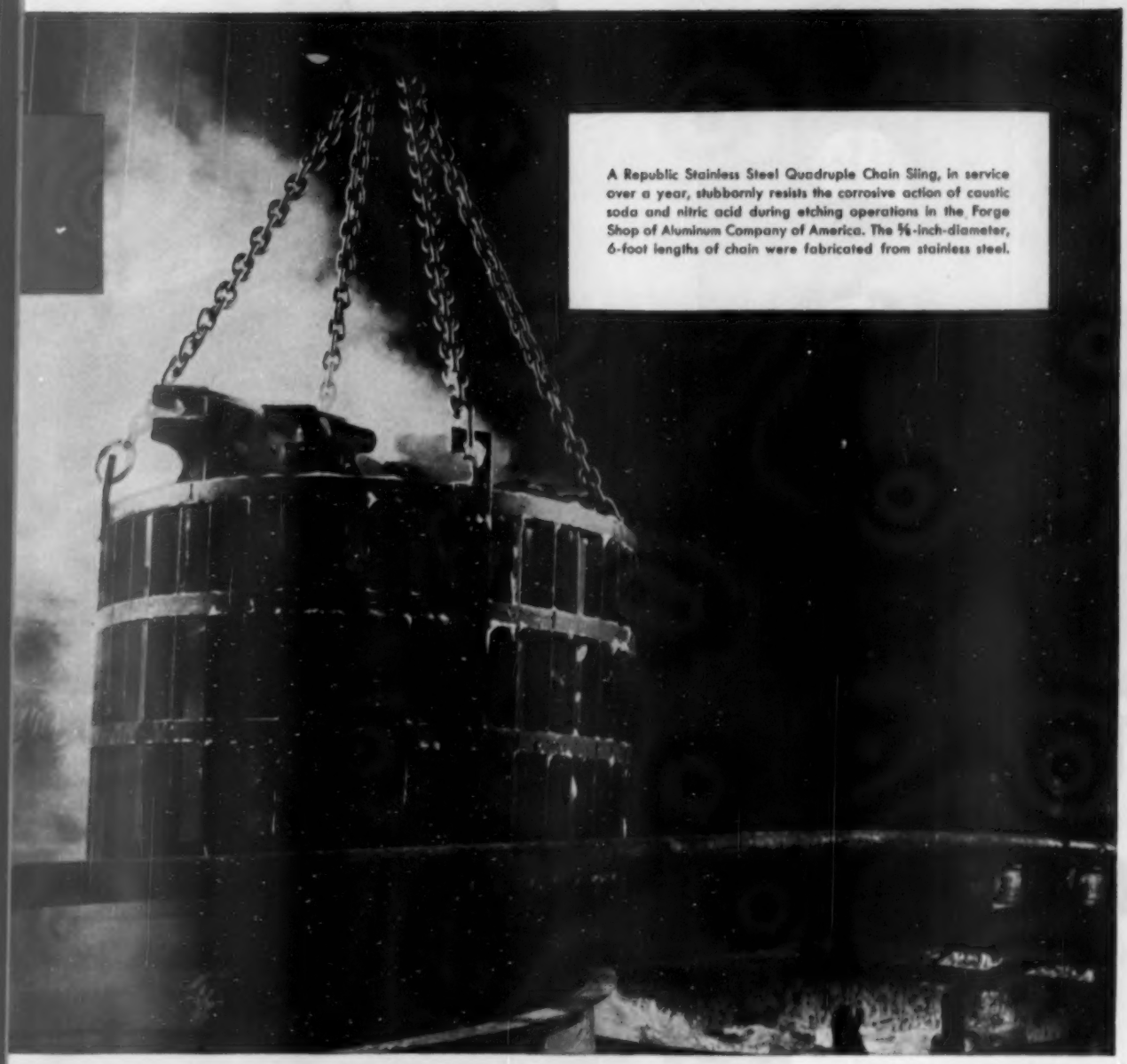
So, whether your chain problem is corrosion-resistance, materials handling or product applications—call your Republic Chain Distributor. He can come up with the answer. Mail the coupon for the name of your nearby Republic Chain Distributor.

# REPUBLIC STEEL

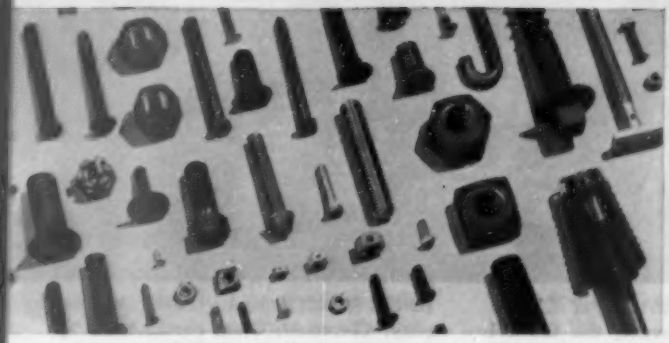
*World's Widest Range of Standard Steels and Steel Products*

**HERE'S THE ANSWER TO THE PROBLEM OF MORE SPACE**—Truscon Steel Buildings. Whether you need a single building or a well-arranged group, Republic's Truscon Division can help you select the right layout to meet your requirements. You'll get a building that's fire resistant, well lighted, properly ventilated, easy to maintain. Truscon engineers will help you from beginning to completion.

**PIPE PROBLEMS?** Republic Steel Pipe may be the answer. It's been satisfying customers for over 40 years. Today, the improved Continuous Butt Weld process makes it better than ever, yet it costs no more than ordinary pipe. Republic Steel Pipe has uniform strength and ductility. It is easily threaded, readily bent. Your Republic Pipe Distributor has it in sizes you want.



A Republic Stainless Steel Quadruple Chain Sling, in service over a year, stubbornly resists the corrosive action of caustic soda and nitric acid during etching operations in the Forge Shop of Aluminum Company of America. The ⅝-inch-diameter, 6-foot lengths of chain were fabricated from stainless steel.



**FASTENER PROBLEM?** You can get exactly the fasteners you need for assembly and maintenance work from more than 20,000 regular types and sizes made and stocked by Republic. They're always uniform, easy to assemble, tough and strong to withstand shock and vibration. Specify Republic Fasteners on your next order from your distributor.

**REPUBLIC STEEL CORPORATION**
**3140 East 45th Street**
**Cleveland 27, Ohio**

REPUBLIC STEEL

☐ Please send the name of my nearest Republic Chain Distributor.

I am also interested in more information on:

☐ Truscon® Steel Buildings ☐ Steel Pipe ☐ Fasteners

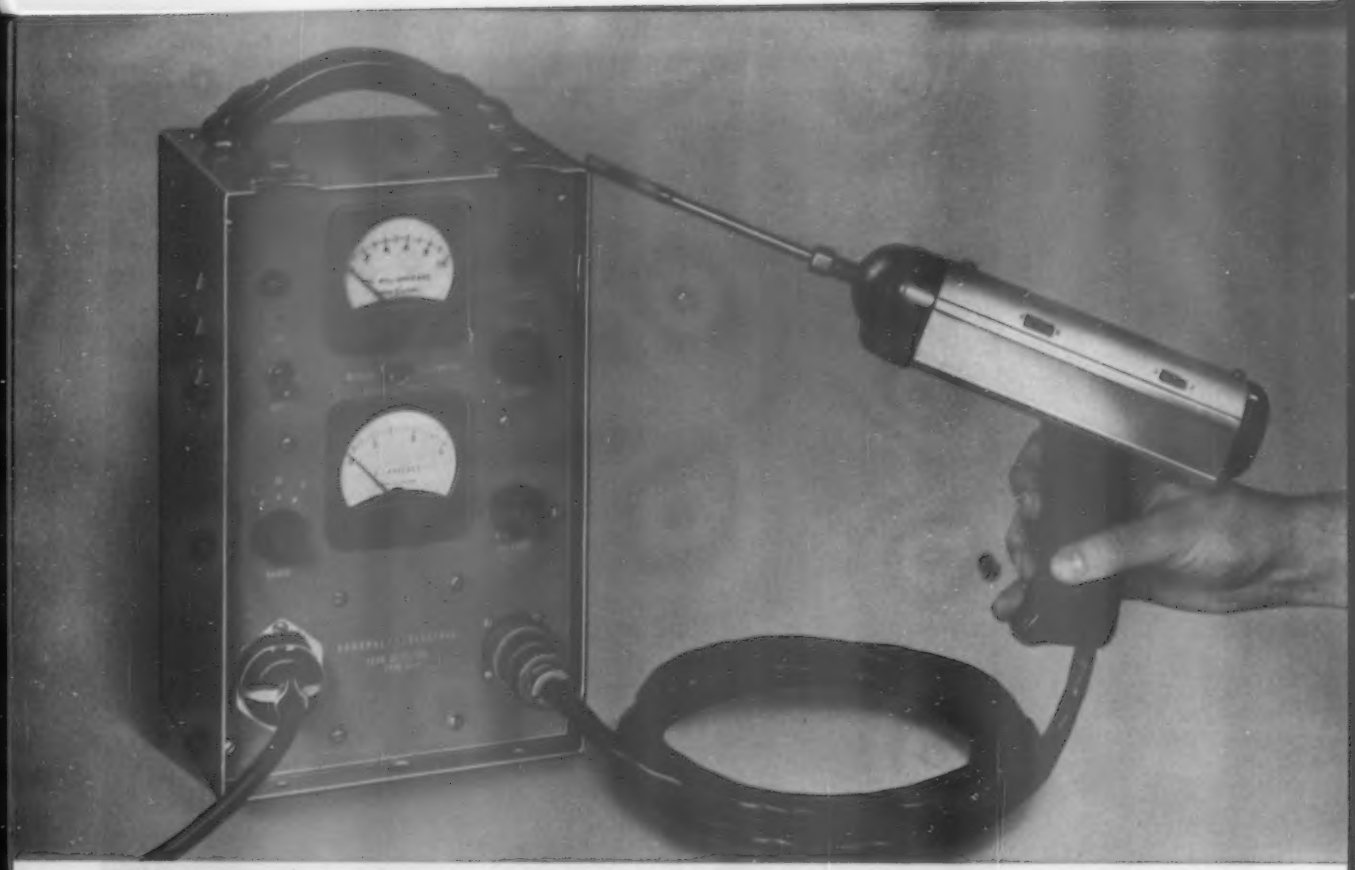
Name_____ Title_____

Company_____

Address_____

City_____ Zone____ State_____

E-9994



**1 HIGHLY SENSITIVE,** the G-E Type H-1 leak detector will detect a leak of 1/100 ounce of "Freon"* a year. A versatile instrument, the detector is designed to simplify the locating of leaks in any closed system containing "Freon," or some other halogen compound; or any system into which such a compound may be introduced as a tracer. Price including detector unit, control unit, and power-supply lead is $604.50.** For further information, mail coupon below.

## G-E LEAK DETECTOR SERVES INDUSTRY AS

## Here's How Others Are Benefiting by Using the New Type H-1 Leak Detector

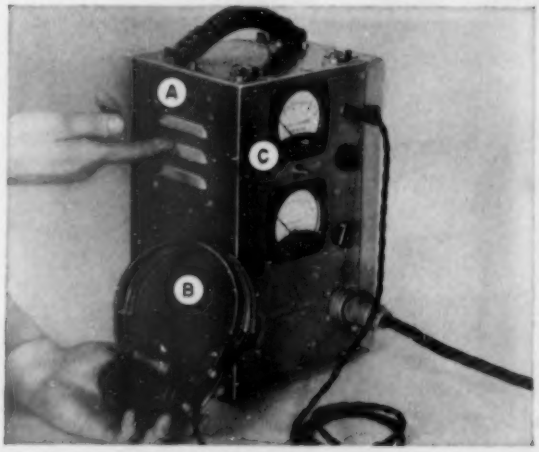
**IN ASSEMBLY-LINE TESTING** of Lincoln automobile air-conditioners, the General Electric Type H-1 leak detector is used to quickly and sensitively "sniff" all vital connections under the chassis and hood.

**TO CUT REJECTS,** the Angle Products Company, Cleveland, Ohio, checks their hydraulic oil and fuel tanks with the G-E leak detector. The new device has reduced the company's inspection time by 35%.

*Registered trade-mark, Kinetic Chemicals Div. of E. I. du Pont de Nemours & Co.
**Manufacturer's suggested retail price.

# New, Dependable G-E Leak Detector Simplifies Locating Hard-to-find Leaks

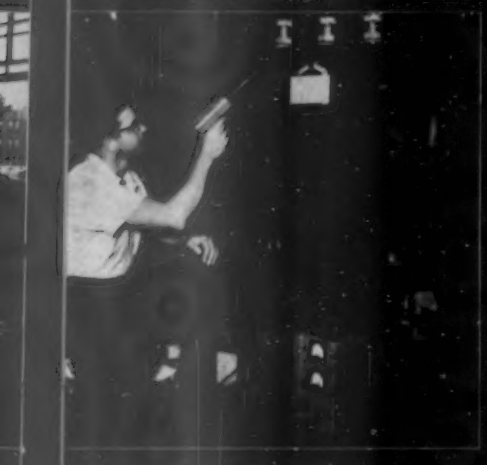
**EASY TO OPERATE—READILY PORTABLE—EXTREMELY SENSITIVE**




**2** **LEAK INDICATIONS** by variable-pitch loudspeaker (A), earphones (B), and instrument dial (C) assure a true leak signal. Earphones, not supplied, may be purchased from your radio-supply dealer.

**3** **READILY PORTABLE,** weighing only 24½ pounds, the unit may be carried to where it is needed. Leads and probe may be stored conveniently in rear of control cabinet. Sturdy carrying strap adds to the portability of the instrument.

## IMPORTANT TESTING AND INSPECTION TOOL



### FREE DEMONSTRATION

SECTION D603-60
GENERAL ELECTRIC COMPANY
SCHENECTADY 5, N. Y.

☐ Please send me a copy of your bulletin on the Type H-1 Leak Detector (GEC-233).
☐ I would like a demonstration.

Name .....

Company .....

Street .....

City ..... Zone ..... State .....

**FOR QUICK, ON-THE-SPOT TESTING** for leaks in large power transformers and network protectors, the Georgia Power Company employs the new readily portable, easy-to-use G-E leak detector.

**AN AID IN ASSURING FREEDOM FROM LEAKS,** the G-E leak detector provides North American Aviation with a highly sensitive instrument for making extra-sensitive leak tests of aircraft fuel cells.

# GENERAL ELECTRIC

Mr. Vincent Sillitta, Traffic Manager of Clarostat Mfg. Co., Inc., discloses

# "How this guided missile gets there on time!"

"... 5, 4, 3, 2, 1, *fire* ... and a Clarostat product helps head the missile for an 'enemy' bomber!

"But before its deadly rendezvous, that tiny part of the missile's 'brain,' a Clarostat resistor, had to keep another vital appointment—with the Guided Missile production schedule.

"That date was kept by Air Express!

"We ship up to 15,000 pounds of Clarostat Resistors per month by Air Express. Their sizes range from the one mentioned above—finer than a human hair—to shipments weighing one hundred pounds and more.

"With Air Express help, we can meet extremely exacting delivery specifications. Yet most shipments cost *less* than by any other air service. A 25 lb. shipment from Boston to Toledo, for instance, costs $6.45. That's 5¢ *less* than the next lowest air carrier—and the service can't be compared!"

It pays to express yourself clearly. Say Air Express!

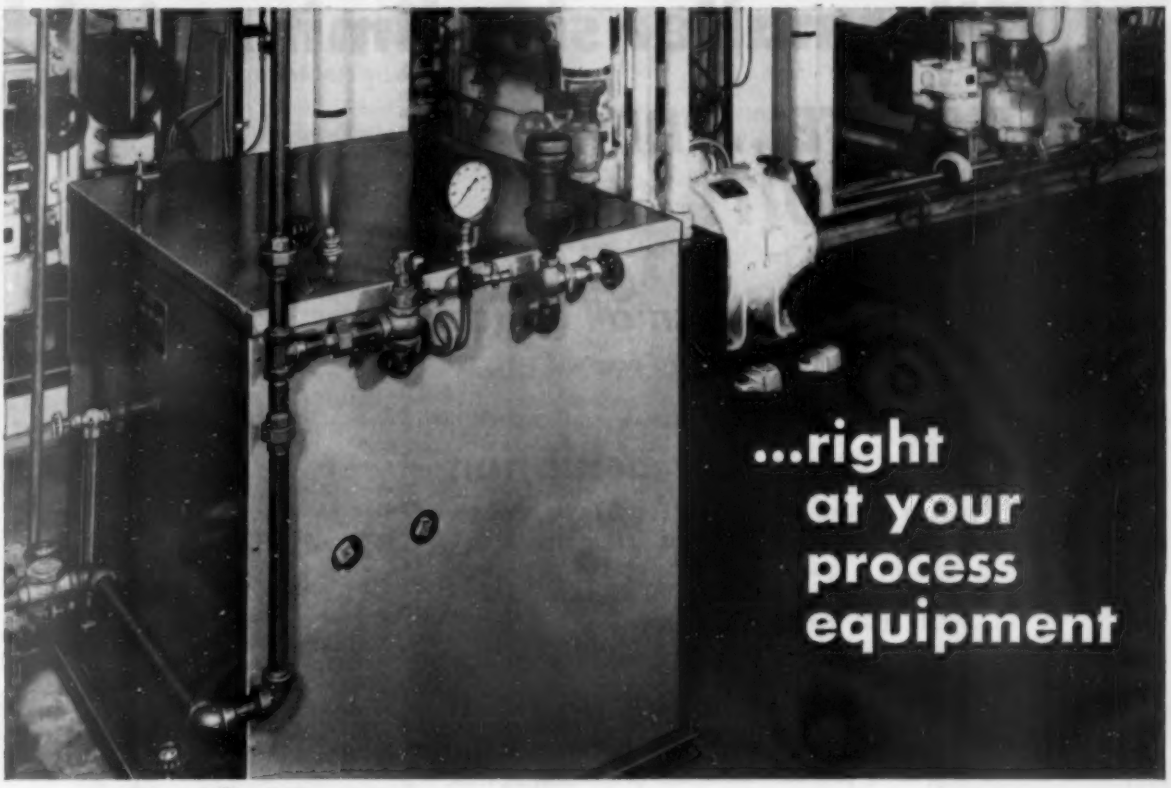
**Air Express**

GETS THERE FIRST *via U.S. Scheduled Airlines*

CALL AIR EXPRESS ... *division of* RAILWAY EXPRESS AGENCY

for as little as $685

# you can have high pressure steam




## with a Pantex Speedylectric Steam Generator

Think of it! — Speedylectric lets you have constant temperature "dry" steam wherever you want it for as little as $685. Install it near your platen presses, or for degreasing, and phosphatizing, or on jobs that are remote from your central boiler. No fumes, no flame, no smoke-stacks or other complicated installation problems. Just plug in to either 220, 440 or 550v outlet, connect piping, and you have an ever-ready source of high pressure steam that you can control precisely.

Speedylectric utilizes the electrode principle — the simplest, lowest cost method for generating steam electrically. It has no coils, tubes or electric elements to scale and burn out. No feed water treatment or daily blow-down is needed. Equally important, Speedylectric is safe from fire dangers . . . no open flame or low water explosion hazards. (Underwriter's Laboratories Listing) 1 to 60 Bhp; 15 to 500 Psi. Why not write for complete data and illustrated Bulletin.

*Among leading users are*: Aluminum Co. of America • Boeing Airplane Co. • Celanese Corporation of America Cutler-Hammer, Inc. • Dow Chemical Co. • Eastman Kodak Co. • Ford Motor Co. • General Electric Co. Liggett & Myers Tobacco • Republic Steel Corporation • Shell Oil Co. • Westinghouse Electric Corporation

**Speedylectric Steam-Jet Cleaner** lets one man do the work of five. High pressure jet of dry steam and solvents quickly removes grease and dirt accumulations from machines and equipment *without* flooding floors. No need to stop nearby production or move machines outside. Completely safe and portable.

**Pantex Manufacturing Corporation**
Box 660H Pawtucket, R. I.
*Send me complete illustrated data on:*
☐ Pantex Speedylectric Steam Generators.
☐ Pantex Speedylectric Steam-Jet Cleaners.

NAME AND TITLE _____
COMPANY _____
ADDRESS _____

MICRO SWITCH Precision Switches
A PRINCIPLE OF GOOD DESIGN

# Here's a NEW, smaller size limit switch!

## LONG LIFE...PRECISE ...2 CIRCUIT!

### compact to fit in small space

Housing is 3-11/16″ high, 1-9/16″ deep and 1-17/32″ wide.

### versatile for any actuation

You can adjust it to operate clockwise, counter clockwise, or in both directions. Head may be positioned in 4 quadrants with actuation possible from any quadrant. Roller lever is adjustable through 360°, locking at any position.

### sealed for any environment

Seals on actuator shaft and between actuator head and housing provide maximum protection against entrance of dust, oil or other liquids.

New MICRO SWITCH LS Limit Switch

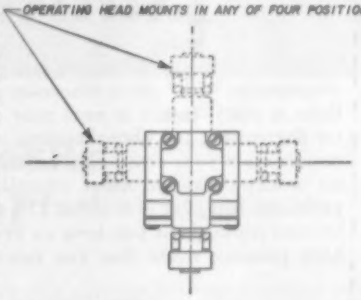
### high capacity

Rated at 10 amperes, 120, 240, 480 volts a-c; ½ HP, 115 volts a-c; 1 HP, 230 volts a-c; Pilot Duty—600 volts a-c, maximum.

**See this new MICRO SWITCH "LS" Limit Switch at your local MICRO SWITCH Distributor. Look in the Yellow Pages of your phone book under "Switches, Electric"**

**Contact arrangement**

Contact arrangement of basic switching unit is double-throw, two-circuit, single-pole, double break.




**Adjustable head assembly**

*MICRO SWITCH products make plant equipment safer, more automatic and more productive*

**A complete line of snap-action and mercury switches**

MICRO SWITCH provides a complete line of extremely reliable, small-size, high-capacity, snap-action precision switches and mercury switches. Available in a wide variety of sizes, shapes, weights, actuators and electrical characteristics. For all types of electrical controls.

**MICRO SWITCH**

A DIVISION OF MINNEAPOLIS-HONEYWELL REGULATOR COMPANY

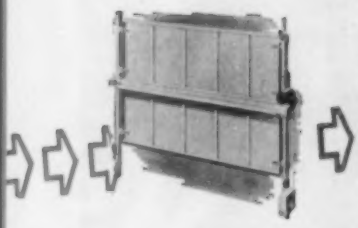
In Canada, Leaside, Toronto 17, Ontario • FREEPORT, ILLINOIS

## taking the extra stresses

Freight elevators need extra ruggedness of design to stand up under industrial power truck loading "punishment." The arrows in the diagrams at the left show how impact stresses vary when the elevator platform is level, below or above the landing. They also show the effects of a fast braking stop. These and the stresses of off-balance loading, and extra static loading are at work, not singly, but simultaneously and in endless combinations—as described in detail in Otis Heavy Duty Freight Elevators booklet B-705.

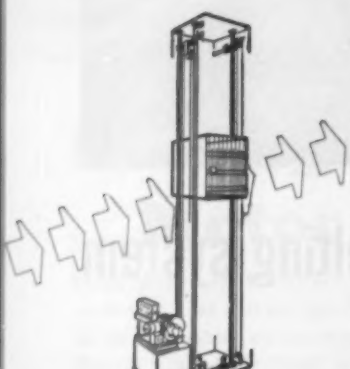
## simplifying multi-floor handling

Freight elevators can easily be made to step up the efficiency of floor-to-floor production lines. The same electronic skill ***that developed automatic operatorless AUTOTRONIC® elevators for busy office buildings*** is ready to make completely automatic freight elevators an integral part of vertical production lines. This thinking can be applied to new buildings, to new elevators for existing buildings, and to modernizing outmoded light duty, general duty and heavy duty freight elevators.



## time-saving hoistway doors

Otis power-operated biparting hoistway doors open while the car levels. This is a major time-saving feature. As compared with manual operation, automatic power operation is safer, quicker, smoother, and materially reduces round-trip time for busy freight elevators. The electric door operator does not depend on "coast" but drives the doors and car gates quietly to the fully opened and closed positions—as described in Otis Hoistway Doors booklet A-389 for new installations and modernization.



## save costly building alterations

Otis Light Duty freight elevators have a semi self-supporting framework that permits installation in new and existing hoistways without reinforcing the building, or adding overhead supports, or building a penthouse. They can be used for any rise up to 35 feet at a speed of 25 feet per minute with lifting capacities of 1,500, 2,000 and 2,500 pounds. They're described in Otis booklet B-720.

## value of a maker's pride

A perfectly performing installation is Otis' best salesman. That's why Otis maintenance is planned to keep elevators running like new—***year after year!*** Preventive maintenance is ***engineered service by the maker*** that prevents slowdowns and breakdowns; extends elevator life by 50%; eliminates expensive, unexpected repair bills; keeps replacement parts readily available; and provides 24-hour-a-day service on a nationwide basis with factory-and-field trained men that have a knowledge of elevatoring that can't be matched.

**OTIS ELEVATOR COMPANY,** 260 11th Ave., New York 1, N.Y.

*OFFICES AND SERVICE IN 295 CITIES ACROSS THE U. S. AND CANADA*

directional arrows

for MATERIALS HANDLING

- Light, General and Heavy Duty FREIGHT ELEVATORS
- DUMBWAITERS
- HOISTWAY DOORS
- MODERNIZATION
- MAINTENANCE
- PASSENGER ELEVATORS

Otis

# Here's how a SPANG® CW steel pipe snow-melting system can work for you!

You can forget about snow removal all winter long . . . save yourself money . . . keep sidewalks, driveways and outdoor shipping platforms open in any kind of weather . . . build customer goodwill . . . eliminate an accident hazard. You can do all this with a good, reliable snow-melting system of SPANG CW Steel Pipe.

The best time to install a system is right now while the weather is good. All it takes is a little planning with your heating contractor. And the cost of a SPANG CW Steel Pipe Snow-Melting System is a lot less than you think.

SPANG manufactures its steel pipe under *quality-control* conditions and tests and inspects it thoroughly before shipment. This careful process will give you a *top-quality* installation with years and years of trouble-free service.

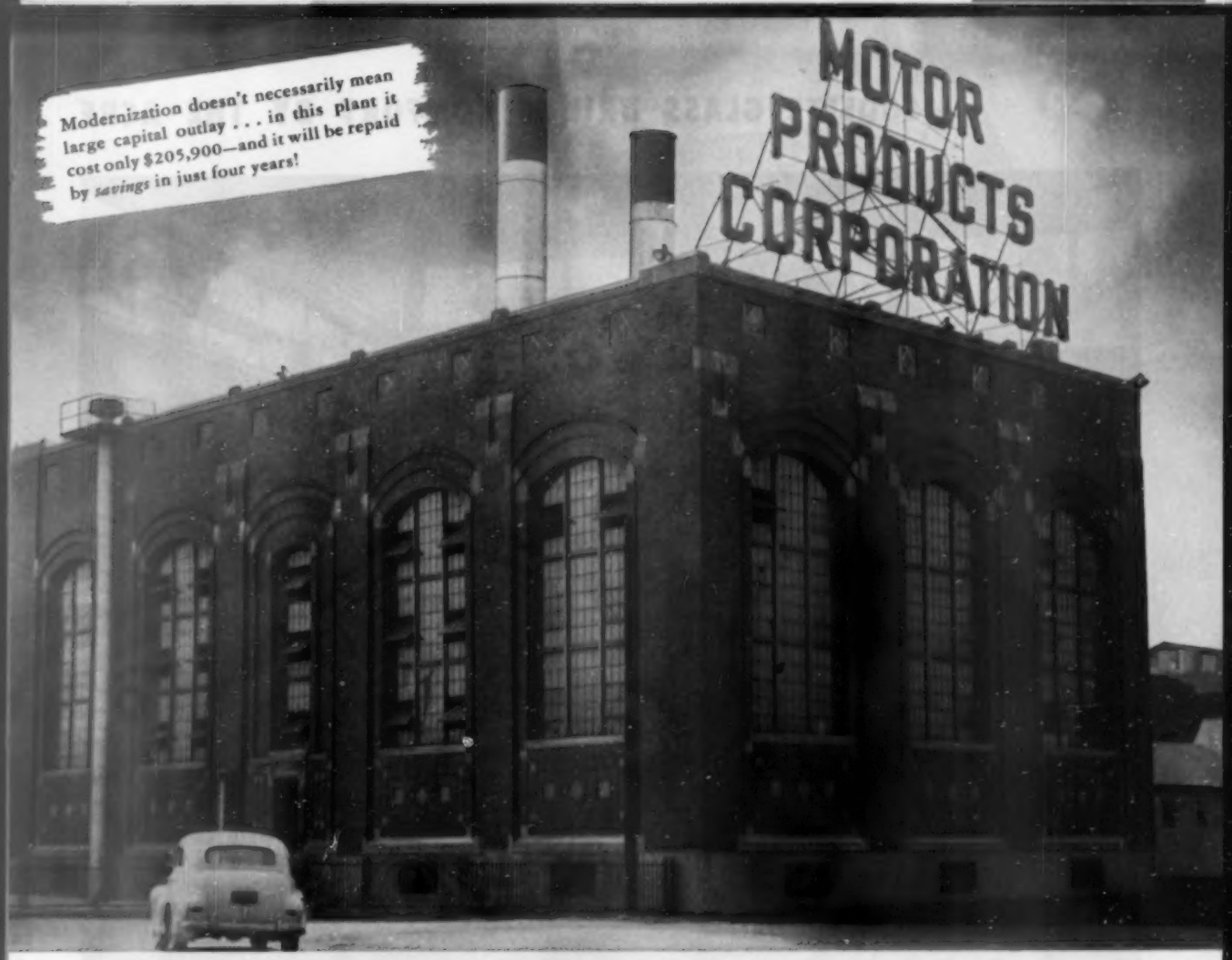
## GET MORE INFORMATION TODAY!

Write to Spang-Chalfant for a free copy of the booklet "Steel Pipe Snow-Melting and Ice-Removal Systems." Then start planning your installation. And be sure the pipe is SPANG CW Steel Pipe!

**SPANG-CHALFANT**

DIVISION OF THE NATIONAL SUPPLY COMPANY

General Sales Office: Two Gateway Center, Pittsburgh, Pa. District Sales Offices: Atlanta, Boston, Detroit, Houston, Los Angeles, New York, Philadelphia, Pittsburgh, St. Louis


Modernization doesn't necessarily mean large capital outlay . . . in this plant it cost only $205,900—and it will be repaid by *savings* in just four years!
MOTOR PRODUCTS CORPORATION

# Burning coal the modern way saves Motor Products $54,000 a year

Faced with poor boiler control, air pollution difficulties, inefficient coal and ash handling and other costly defects in its outmoded power system, Motor Products Corp., Detroit, called in local consultants to make a study. The engineers recommended a modernization program, involving some new equipment along with the adaption of existing units to new systems.

This modernization is saving Motor Products time, labor, and money—better than $54,000 per year. Now the entire operation is clean and efficient. Production of economical steam is faster, simpler, more reliable and well within the bounds of smoke and dust regulations.

## Investigate Your Fuel Costs

If you're planning to modernize your plant or build a new one—or if you are just interested in cutting fuel costs—find out how coal, burned the modern way, compares to other fuels. Why not talk to a consulting engineer or your nearest coal distributor? Their advice may save you thousands of dollars each year.

## *facts* you should know about coal

Up-to-date coal burning equipment can give you 10% to 40% more steam per dollar.

Automatic coal and ash handling systems can result in a virtually labor-free plant.

Coal is the safest fuel to store and use. No dust or smoke problems when coal is burned with modern equipment.

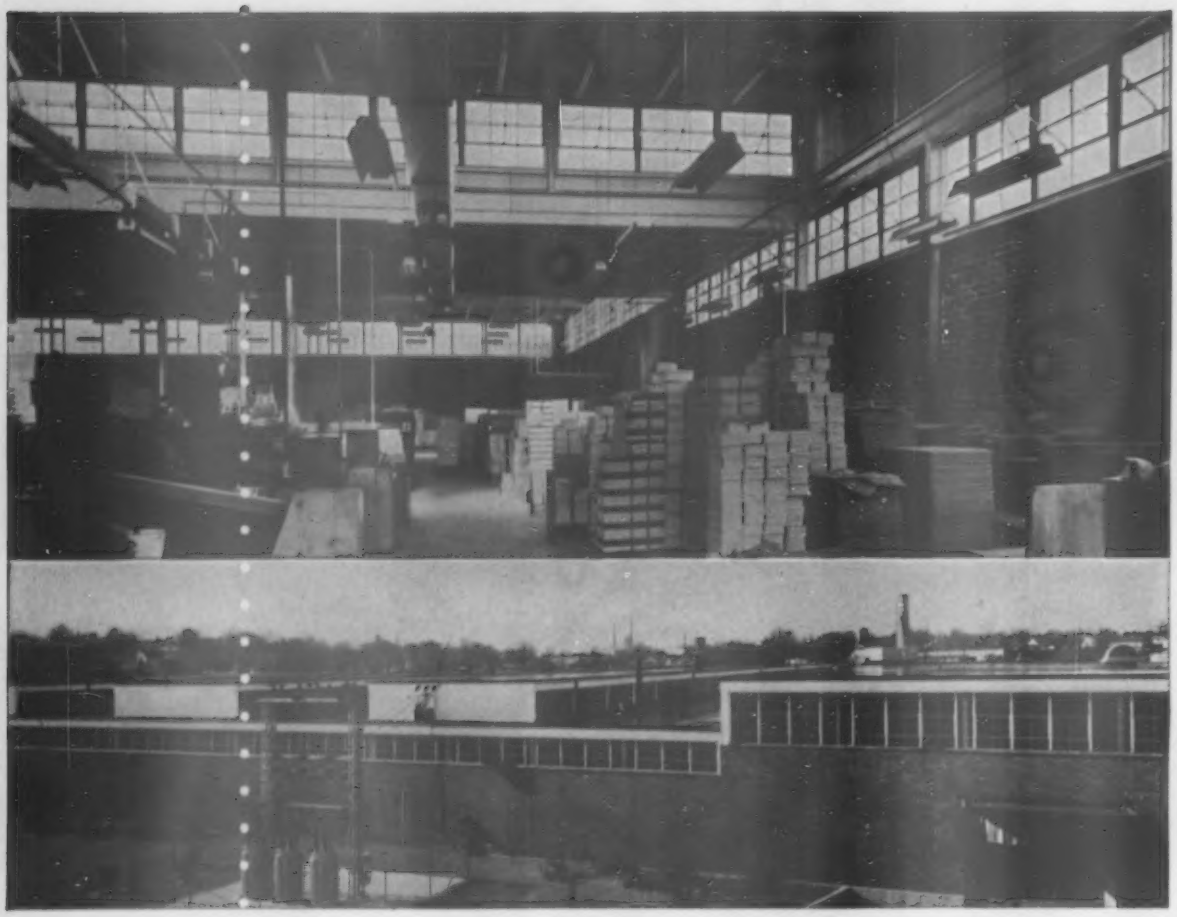
In most industrial areas, bituminous coal is the lowest-cost fuel available.

Between America's vast coal reserves and mechanized coal production methods, you can count on coal being plentiful and its price remaining stable.

For further information or additional case histories showing how other plants have saved money burning coal, write to the address below.

NATIONAL COAL ASSOCIATION
Southern Building, Washington 5, D.C.

# COOLITE GLASS BRINGS COMFORT BY THE ACRE



Moscowitz, Wilner & Milkey, Architect. J. A. Jones, Contractor.

## Montag's New Paper Plant Keeps Bright and Comfortable Under 24,000 Sq. Ft. of Coolite

Montag, maker of fine stationery and school supplies for 65 years, recently occupied its new plant.

The Montag building covers 280,000 square feet and was designed to be the most modern stationery and school supply plant in the world. Conceived as an ideal plant for people and machines, it provides finest lighting, heating, humidity conditions and employee working and recreational facilities.

To achieve these aims, it is copiously daylighted with over 24,000 square feet of Coolite Glass by Mississippi. Coolite not only provides high levels of comfortable illumination, diffusing harsh sunlight for visual comfort . . . it absorbs much of the unwanted and uncomfortable solar heat rays, helps keep the vast interior cooler on brightest days.

Employees feel better, see better, work better under Coolite . . . for Coolite filters out unwanted harsh qualities of "raw sunlight" . . . permits extensive use of glass for low cost daylighting without undue heat.

**In new construction or modernization, specify translucent light diffusing glass by Mississippi. Manufactured in a wide variety of patterns and surface finishes to help you solve any daylighting problem. See your nearby distributor of quality glass.**

MISSISSIPPI Glass COMPANY

88 ANGELICA ST. SAINT LOUIS 7, MO.

NEW YORK • CHICAGO FULLERTON, CALIFORNIA

Write today for free literature. Address Dept. 11.

WORLD'S LARGEST MANUFACTURER OF ROLLED, FIGURED AND WIRED GLASS

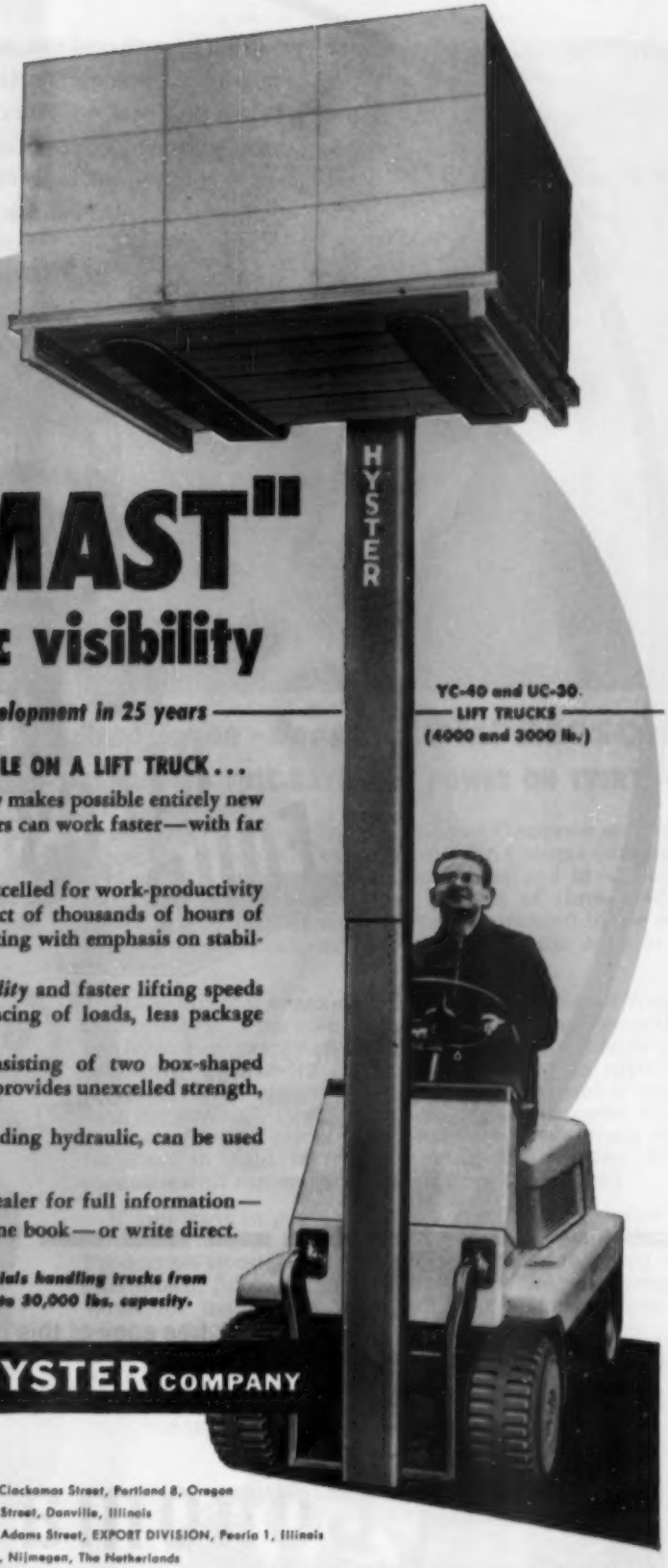
see our catalog in S or write for copy

the
revolutionary

# NEW HYSTER "MONOMAST"

## with panoramic visibility

*the greatest basic lift truck development in 25 years*




YC-40 and UC-30
LIFT TRUCKS
(4000 and 3000 lb.)

**OPERATOR VISIBILITY NEVER BEFORE POSSIBLE ON A LIFT TRUCK...**

Exclusive "Monomast" *panoramic visibility* makes possible entirely new techniques in lift truck operation. Operators can work faster—with far greater safety.

**SAFER, STRONGER, FASTER.** "Monomast", unexcelled for work-productivity — five years in development — the product of thousands of hours of Hyster Proving Ground and actual job-testing with emphasis on stability, rigidity and strength.

Exclusive "Monomast" *panoramic visibility* and faster lifting speeds means faster approach, more accurate placing of loads, less package damage—*far more tons moved per hour.*

Unique "Monomast" construction, consisting of two box-shaped sections, one telescoping within the other, provides unexcelled strength, rigidity and safety.

Hyster® standard job-attachments, including hydraulic, can be used with the "Monomast".

**SEE THE DIFFERENCE.** Ask your Hyster Dealer for full information—he's listed in the yellow section of the phone book—or write direct.

***Materials handling trucks from 1000 to 30,000 lbs. capacity.***

**HYSTER COMPANY**

2956 N. E. Clackamas Street, Portland 8, Oregon
1056 Myers Street, Danville, Illinois
1856 North Adams Street, EXPORT DIVISION, Peoria 1, Illinois
Hyster N.V., Nijmegen, The Netherlands

**FOUR FACTORIES:** PORTLAND, OREGON; DANVILLE, ILLINOIS; PEORIA, ILLINOIS; NIJMEGEN, THE NETHERLANDS

**"MONOMAST"** *trademark registration applied for.*

ON DISPLAY
*at your*
HYSTER
DEALER



"PAID FOR ITSELF IN LABOR SAVED"

If you haven't read this important booklet, your production line may be operating at less than peak efficiency. Your operations may be beating competition with HSS today, but you will likely need carbide tooling to be the leader tomorrow.

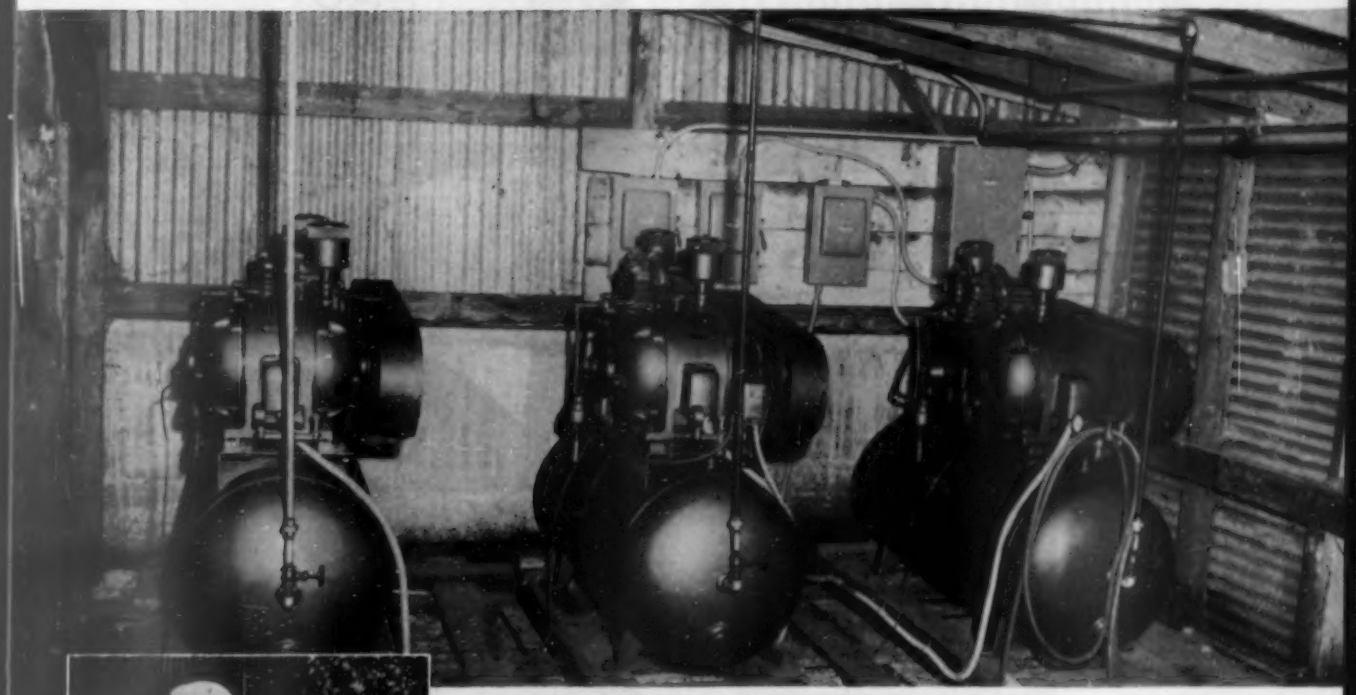
Write for your free copy of this important booklet today!

# Conomatic

THE MACHINE TOOL SHOW CHICAGO, ILL. BOOTH 401

CONE AUTOMATIC MACHINE COMPANY, INC., WINDSOR, VT., U.S.A.

# "PAID FOR ITSELF IN LABOR SAVED"



## WAYNE *Production-Booster* COMPRESSORS

### PRE-TESTED GUARANTEED FULL-RATED AIR POWER ON EVERY JOB

● In the cotton warehouse of Shiner Compress & Warehouse Co. at Shiner, Texas, Wayne Air Compressors have proved their ability to boost production and save money too! The cotton cleaning unit consists of three 6408H, 10 HP Wayne electric air compressors arranged to use one, two or all three at once, depending on the amount of air needed.

The words of the manager speak for the success of Wayne Compressors, "Four men on this unit can clean more cotton per hour than twenty or more by hand picking. I have also connected the line to the sprinkler system to maintain pressure... now use air on my Loose press instead of steam with big savings . . . air on grease guns allows easier maintenance of rolling stock. This Wayne unit has already paid for itself in eight months by actual labor saved. It is economical to run and the maintenance is about nil."

If you want to get the most for your dollar invested be sure to investigate the extra value you get in every Wayne Production-Booster Air Compressor. Remember you get guaranteed, full-rated output in every Wayne compressor. Write for the booklet that tells you all about how to boost production.

**THE WAYNE PUMP COMPANY**

*Industrial Division* • *FORT WAYNE, INDIANA*

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**Wayne** *Industrial Products*

HOSE REELS

LIFTS

LUBRICANT DISPENSERS

INDUSTRIAL PUMPS

INVADER PUMPS

## Not if you use new, disposable KIMWIPES!

Don't let expensive cloth and waste wipers rob you of profits. Replace them with Type 1300 KIMWIPES—the *modern* industrial wipers that give you four to ten times more wiper area per dollar!

Yes, and new Kimwipes 1300 are soft, strong and absorbent. A full 12" x 18" in size, they hold up to 8 times their own weight in liquids. They're non-abrasive, too. There's no holdover of metal chips or other infectious material that may cause dermatitis and loss of man hours. Type 1300 Kimwipes are absolutely clean to start with, and are disposed of after use. Ask your salesman for samples. And remember, you can also buy Type 900-S Kimwipes (optical wipers) and Type 900-L Kimwipes (regular wipers). Save money. Order today!

Kimberly Clark
INDUSTRIAL WIPERS
Kimwipes

Kimberly-Clark Corporation • Neenah, Wisconsin

# Wherever you look AT THE MACHINE TOOL SHOW YOU'LL FIND

BLISS
E. W. Bliss Company
BOOTH #1414

BRYANT
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CMC CLEARING USI
Clearing Machine Corp.
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CLEVELAND
The Cleveland Automatic Machine Co. — BOOTH #412

CONSOLIDATED MACHINE TOOLS
Consolidated Machine Tool Co. — BOOTH #217

EDLUND
Edlund Machine Co.
BOOTH #115

famco
Famco Machine Company
BOOTH #507

FEDERAL PRESS
Federal Press Company
BOOTH #801

FOSDICK
The Fosdick Machine Tool Co.
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Fox Engineering Company
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GREAVES
Greaves Machine Tool Co.
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## speeds installation of any machinery protects accuracy of precision machines

These machine tool builders cut set-up time at the Machine Tool Show from hours to minutes with BARRYMOUNT® Leveling Isolators. No drilling floors, no setting lag bolts, no shimming — they just set their machines on the Barry mounts, adjusted the leveling screws, and the normally tedious, costly job was done.

This is not just a show trick — it's a standard efficiency procedure for new installations and re-installations in large and small plants all over the country. And, *at the show or in your plant*, the isolation built into Barry mounts protects precision machines against vibration from nearby heavy equipment.

Visit us at Booth 153, Production Engineering Show, and a Barry engineer will show you how *you* can simplify installation, protect machine accuracy, prolong machine life, and cut maintenance costs with Barry Machine Mounts.

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WIEDEMANN
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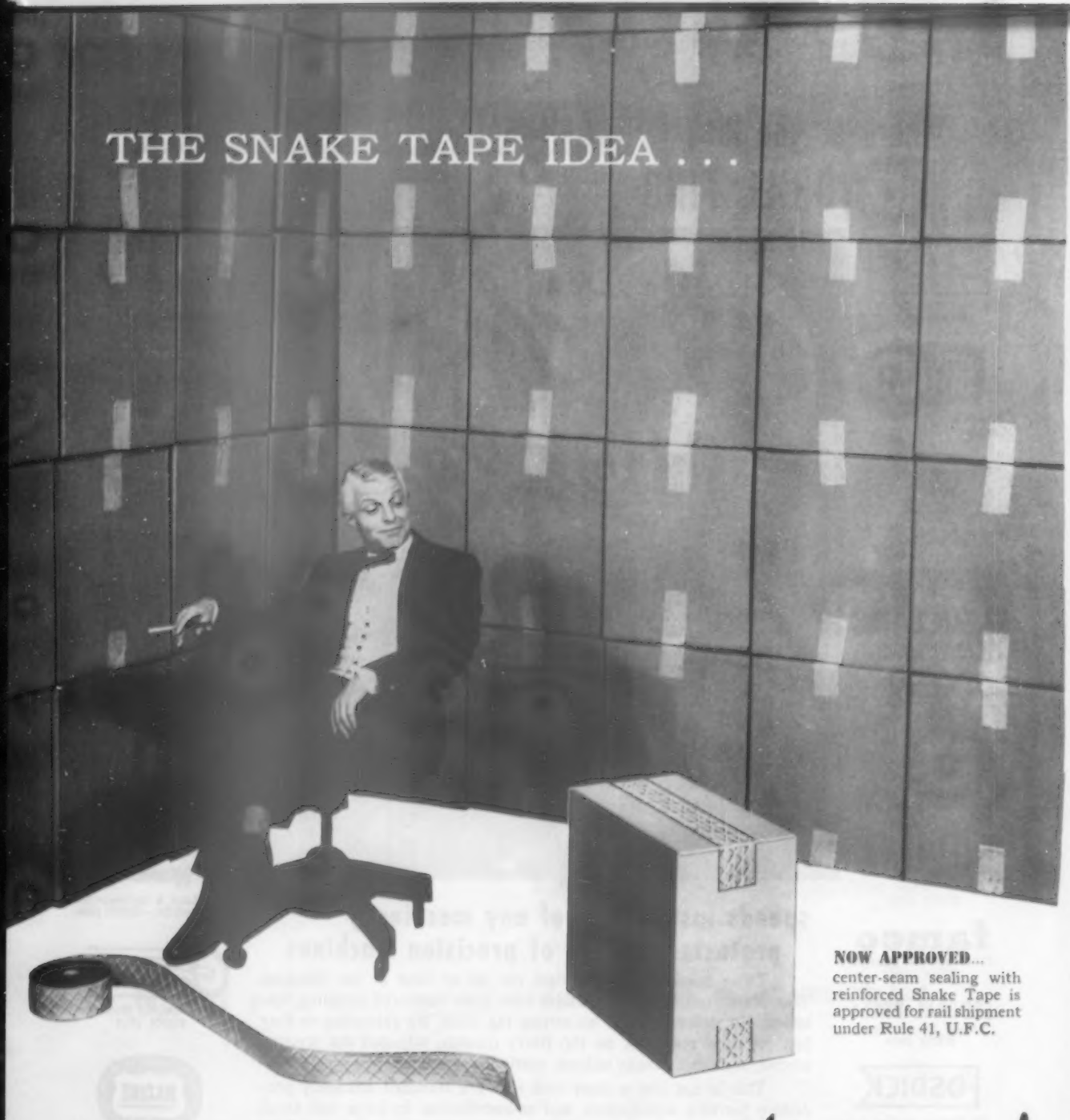
# THE SNAKE TAPE IDEA . . .



**NOW APPROVED...** center-seam sealing with reinforced Snake Tape is approved for rail shipment under Rule 41, U.F.C.

## seals cartons stronger in 1/3 the time!

Seal the center seams only and cut your labor by two-thirds. Seal with *reinforced* Snake Tape and you have a *stronger* carton closure . . . so much stronger, that you'll wipe out all damage claims due to tape failure.

Snake Tape's *rayon* reinforcing ABSORBS shock as do tires reinforced with rayon. But with all its strength, Snake Tape is flexible and easy to apply manually or with automatic taping machines. It's waterproof; comes in 5 widths.

Send now for **FREE** sample and all the facts.
Write: **ANGIER CORPORATION**, Framingham 1, Mass.

Angier SNAKE TAPE

# JOB PROVED

# GERLINGER MAKES SHORT WORK OF LONGEST BEAMS EVER LAMINATED

Timber Structures benefits day-in, day-out, by Gerlinger cost-cut handling. Longer wheelbase and larger tires on fork lift truck insure positive maneuverability at all times regardless of adverse weather conditions, load variance.

Timber Structures management and operators alike praise Gerlinger. The plant keeps 5 fork lift trucks and 3 material carriers busy inside and out every shift. Individually, or as a team, Gerlinger heavy-duty material handlers load the field.

## Fleet of 8 Performs "MIRACLES" in Versatile Operations for Timber Structures, Inc., Portland, Ore.

"When it's a big job in a hurry...and safety is a prime factor...we've come to depend more and more on our Gerlinger equipment!" Timber Structures' Gerlinger fork lift trucks gave emphatic demonstration of these words of Mr. R. W. Mayer, assistant general manager, in a dramatic undertaking which involved loading of five colossal beams for delivery in Washington.

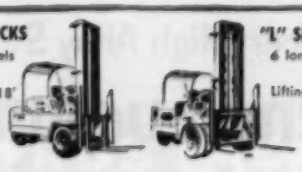
And just why is a Gerlinger fork lift truck able to make routine work of picking up and loading on truck and dolly unwieldy 104-foot laminated beams, each containing 10,164 board feet of lumber and each weighing between 16,000 and 17,000 pounds? Exclusive counter-active weight distribution is part of the answer where variance in load weights and dimensions are concerned. A Gerlinger won't teeter, or back wheels dig in...54% of truck's weight is where it's needed...over front wheels...for maximum traction and easy maneuverability. Fingertip-controlled boom action...another Gerlinger exclusive...actually "floats" loads...any size or off-size...up and onto truck, dock, or pile.

*"Get on the beam"*

Get on the "beam"...get the Gerlinger answer to the particular material handling problem facing your industry. Call your Gerlinger distributor now...he will be glad to prove that Gerlinger can save time, money and manhours for you, too. No obligation, of course.

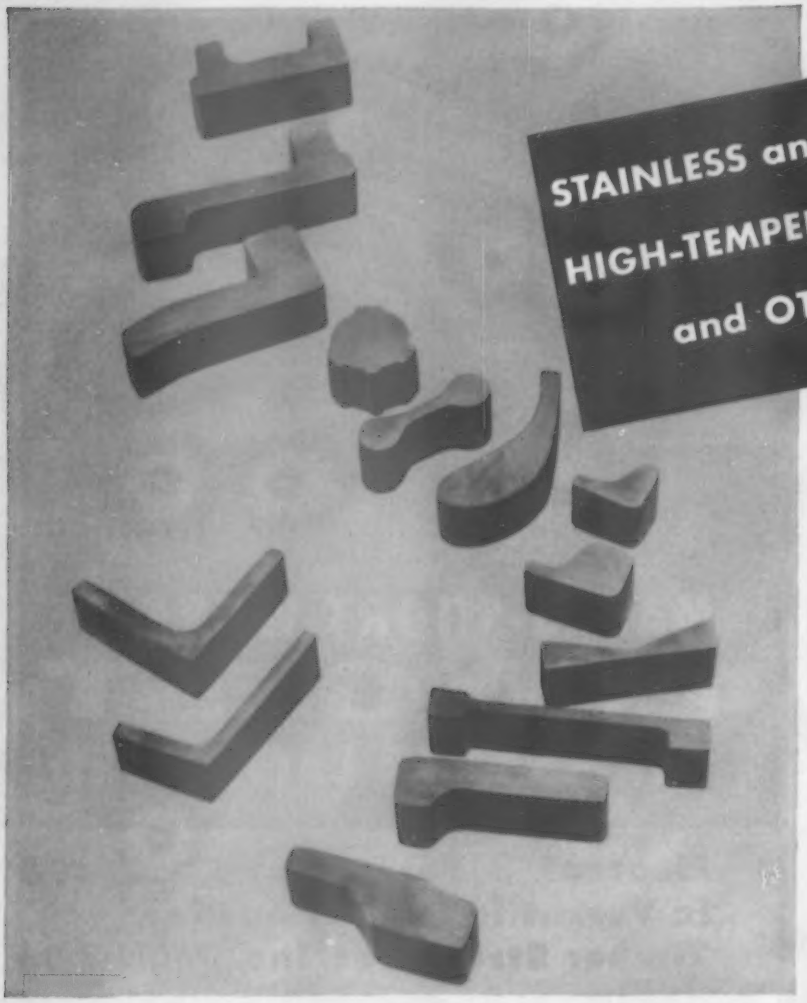
GERLINGER PRODUCTS

**"S" SERIES FORK LIFT TRUCKS**
5 short wheelbase (106") models
4 to 8-ton capacity
Lifting heights from 10' up to 18'



**"L" SERIES FORK LIFT TRUCKS**
6 long wheelbase (130") models
6 to 11-ton capacity
Lifting heights from 10' up to 24'

**GERLINGER CARRIER CO., DALLAS, OREGON**



STAINLESS and TOOL STEELS
HIGH-TEMPERATURE ALLOYS
and OTHER STEELS

# A-L HOT EXTRUSIONS (solid and hollow) may solve problems for you

Where can these leading advantages of hot-extruded special alloy steels apply to your production?

1. Hot extrusions require very little finishing before use, even in the case of involved shapes. The scrap loss is small and you can buy raw materials closer to finish size. You buy less high-cost steel, cut away less of it . . . save both in time and material cost.

2. The range of shapes, solid or hollow, which can be hot-extruded is almost infinite. They can be easily and quickly produced in any quantity. Dies for new or experimental parts cost little and can be made up fast.

● We're ready to serve your needs with hot extrusions in any grade of stainless or high temperature steel, many tool steel grades and other steels. Call us in to help. ***Allegheny Ludlum Steel Corporation, Oliver Building., Pittsburgh 22, Pennsylvania.***

**Help!** (Dept. F-68)

We have a parts problem that hot extrusions might solve. Let's see an AL representative for facts and figures.

- ☐ STAINLESS STEEL
- ☐ TOOL STEEL
- ☐ HIGH TEMPERATURE STEEL
- ☐ OTHER STEELS

Name_____

Company_____

Address_____

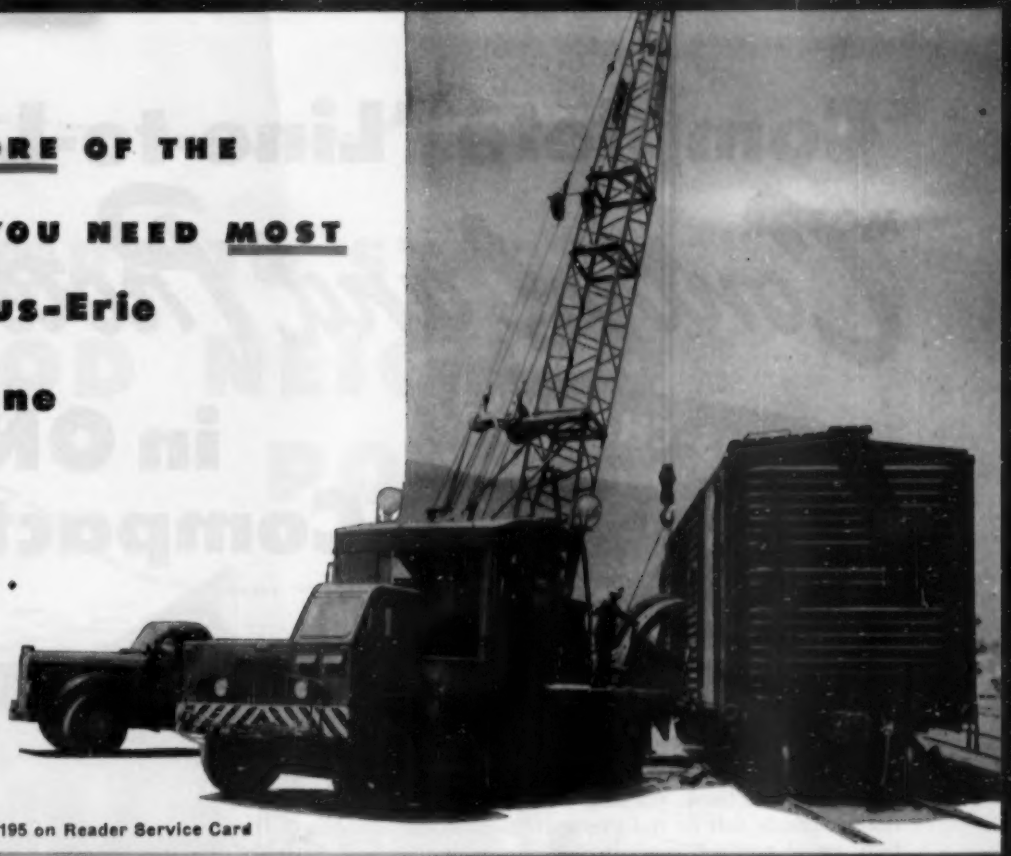
**Leading Producer-High Alloy Steels**

**Allegheny Ludlum**

AL® TIME-TESTED STAINLESS STEEL

WAD 6318

# YOU GET MORE OF THE FEATURES YOU NEED MOST in a Bucyrus-Erie Transit Crane



**HERE'S PROOF....**

*Your Bucyrus-Erie distributor can give you plenty more!*

For More Information Circle 195 on Reader Service Card

| FEATURE | MODEL 15-B | MODEL 22-B | HOW YOU BENEFIT |
|---|---|---|---|
| Friction swing brake. | Standard | Standard | Operator can spot and hold boom point over desired position. |
| Power controlled lowering for main hoist line on lifting crane. | Standard | Standard | Provides high accuracy in lifting or lowering loads. |
| Independent power boom hoist with power controlled lowering. | Standard | Standard | Boom angle can be changed while machine is swinging or propelling, while load is being hoisted or lowered. |
| Open-throat boom design. | Standard | Standard | Permits rigging 2, 3, or 4 parts of line without removing sheave guards. |
| 8-part pendant suspension. | Standard | Standard | Ideal for changing boom lengths conveniently and with minimum downtime. |
| Safety boom stops on all machines equipped for lifting crane service. | Standard | Standard | Added safety. Prevents boom from accidentally snapping over center and striking cab. |
| Boom angle indicator. | Standard | Standard | Enables operator to determine angle of boom at all times. |
| Full 3-side vision from operator's cab. | Standard | Standard | Gives him clear view of his entire operating range and of all men or obstructions in the vicinity. |
| 16-part boom suspension. | Optional at extra cost | Optional at extra cost | Provides slower boom hoisting or lowering for even greater precision control. |
| Boom folding mechanism. | Optional at extra cost | Optional at extra cost | Booms over 60 feet long can be carried folded on job-to-job moves. |

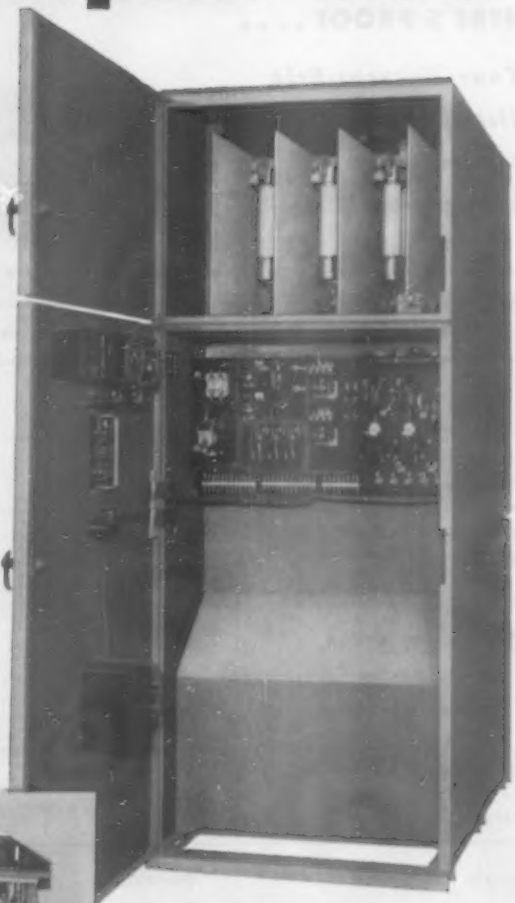
BUCYRUS ERIE

**BUCYRUS-ERIE COMPANY**
**SOUTH MILWAUKEE, WISCONSIN**

126E55C

# Complete "Line-to-Load" MOTOR *Control and Protection* in ONE Compact Unit

**ALLIS-CHALMERS**
**Type H Starters**
FOR 2300 TO 5000 VOLT MOTORS



THE Allis-Chalmers Type H high voltage starter is a complete control unit. Everything needed for efficient motor control and positive protection is engineered into one easy-to-install cubicle.

Control functions, varying with specific job applications, include full or reduced-voltage starting, acceleration, speed control, reversing or non-reversing, and dynamic braking.

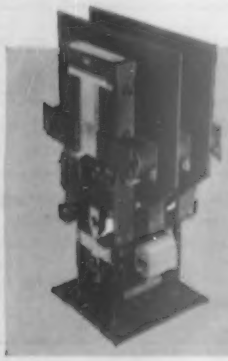
## A few of the many protective features

**Current-Limiting Fuses** clear short circuit in less than ½ cycle . . . long before short can damage contactor or motor.

**Overload Thermal Relay** adjusts for ambient temperatures . . . trips only on motor overload. Allows use of maximum capacity.

**Time-Delay Undervoltage Relay** permits restarting if power is restored within its setting.

**Compartmented Enclosures** isolate high voltages. Dead front construction and electrical interlock on fuse compartment provide additional personnel protection.



**Choice of Air or Oil Contactors**

For complete information, see your Allis-Chalmers representative, or write Allis-Chalmers, Milwaukee 1, Wisconsin. Ask for Bulletin 14B6410B.

A-4580

# ALLIS-CHALMERS

# WHERE TO START A GOOD NEIGHBOR POLICY

The area above, enclosed by the dotted lines, is an important area of good "neighbor relations". Today, more than ever before, plant management is turning its attention to industrial air cleaning — and replacing noxious or nuisance chimney discharges with harmless plumes. Here, indeed, is the good-neighbor policy in action.

"Buffalo", pioneer in this field, has developed a broad line of equipment to meet the most rigid requirements of industry. "Buffalo" units are handling almost every conceivable contaminant, from low concentration toxic gases to stringy or abrasive discharges. They are handling them with high collection efficiency and minimum maintenance.

## "BUFFALO" EQUIPMENT IS AVAILABLE TO SOLVE MANY DIFFICULT AIR CLEANING PROBLEMS

- Gas Absorbers
- Wet Glass Cell Air Washers
- Rotary Multi-Stage Gas Scrubbers
- Hydraulic Scrubbing Towers
- Hydro-Volute Scrubbers
- "DC" Static Washers

WRITE TODAY for the most satisfactory answer to your particular air problem. "Buffalo" know-how and equipment are at your service.

"Buffalo"

## BUFFALO FORGE COMPANY

471 BROADWAY BUFFALO, N. Y.

*Publishers of "Fan Engineering" Handbook*

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*Sales Representatives in all Principal Cities*

VENTILATING AIR CLEANING AIR TEMPERING INDUCED DRAFT EXHAUSTING FORCED DRAFT COOLING HEATING PRESSURE BLOWING

# Let's take a

# new look at quality control

One of the great ideas in steel supply has been taking on new meaning at Ryerson lately—and it will be worth your while to learn about it.

Twenty years ago, the Ryerson plan for Certified Steel was big news because it set standards of quality unequalled in steel from stock at that time. But during the postwar period of great demand, emphasis on quality necessarily gave way a little to emphasis on quantity until additional capacity could be built.

Today, however, there's no compromise! A committee of top Ryerson executives has instituted a sweeping new program of checks and counter-checks. Specifications have been rewritten; inspection techniques tightened; so that today *Certified Steel* means more than ever before. For example, it means that:

— every kind of steel in Ryerson stocks—carbon steel, alloy steel and stainless—is produced to definite specifications for high uniform quality.

— you are protected against the possibility of mixed steels by our spark testing of carbon steel plates and special quality bars, structurals, alloys and stainless bars and plates.

— the specific heat analysis is available for all Ryerson plate steel, special quality carbon bar steel, alloy steel and stainless steel because all are identified by heat number and every heat analysis is kept on file.

— you can use Ryerson alloy steel with complete confidence because a practical 8-step quality-control plan assures dependable performance and guides heat treatment.

— on *all* Ryerson Certified Steels we are able to furnish a certificate of analysis.

Certified Steel means all these things and many more. Its essence is a devotion to quality that has an increasing dollars-and-cents importance to you. The world's largest steel stocks are also the world's finest—backed by over a century of reliability in product and service. Today, more than ever before, you can depend on Ryerson as your best source for the steel you need, when you need it.

## RYERSON STEEL

*In stock: Carbon, alloy and stainless steel . . . bars, structurals, plates, sheets, tubing, reinforcing bars, machinery & tools, etc.*

JOSEPH T. RYERSON & SON, INC. PLANTS AT: NEW YORK • BOSTON • PHILADELPHIA • CHARLOTTE, N. C. • CINCINNATI • CLEVELAND DETROIT • PITTSBURGH • BUFFALO • CHICAGO • MILWAUKEE • ST. LOUIS • LOS ANGELES • SAN FRANCISCO • SPOKANE • SEATTLE

# LOOKING AHEAD IN BUSINESS

**FACTORY OUTPUT is holding up this summer.** It edged up again in June when the Federal Reserve Board Index hit a new high of 141, seasonally adjusted (see chart). Output was probably about the same in July.

Producers of non-durables — chemicals, textiles, rubber and leather, paper and petroleum products — all upped output. This pushed the index up.

*Output of durable goods — cars, trucks, appliances, steel — slipped a bit in June and July. It probably will decline further in August.*

•

**Some of the record output of goods is going into inventories.** Manufacturing, wholesale, and retail inventories increased $600-million in May (latest official figure available) to a total of $78.3-billion, seasonally adjusted. Stocks have no doubt continued to build up in June and July.

**The build-up in stocks — now running about $7-billion a year — is close to the rate in the first half of 1953. The inventory build-up then heralded the recession of 1954. But this time total sales are much higher. Personal incomes, too, are higher than they have ever been. So there is much less cause for worry.**

Soft-goods inventories are not as high, relative to sales, as stocks of hard goods. Sales of food products, textiles, and chemicals have been booming. So inventories of non-durables are in line.

•

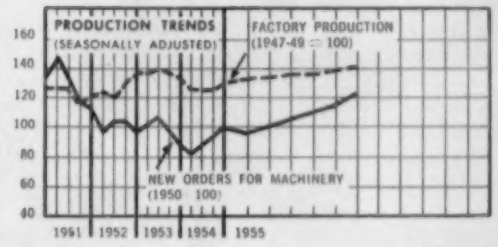
**For makers of hard goods the story is different. Here's the catch:** Steel production at over 90% of capacity has held industrial output 'way up. But a lot of steel has been going into inventory.

Some orders for steel were placed as a hedge against a strike. Others were made in anticipation of the hike in steel prices. Now steel demand, and hence output, may drop. If that happens, industrial production as a whole will fall.

**Detroit is the biggest buyer of steel. And auto production is dropping.** It will pick up again in the fall when the new models go into production. But 1956 models will be little different from 1955's. So there won't be the same surge of new consumer demand.

This means production of 1956 cars won't equal the record 6.8- to 7-million expected this year. Result: Detroit will take less steel from here on.

**FACTORY'S FIGURES OF THE MONTH**




| Indicator | June[p] 1955 | May[r] 1955 | June 1954 |
|---|---|---|---|
| New Orders for Machinery (exc. elec.)[1] | 123 | 116 | 94 |
| Factory Production[2] | 141 | 140 | 125 |
| Consumers' Prices (cost of living)[3] | n.a. | 114.2 | 115.1 |
| Industrial Prices (materials, supplies)[3] | 115.6 | 115.5 | 114.2 |
| Manufacturing Employment (millions)[3] | 16.5 | 16.3 | 15.8 |
| Total Employment (millions)[4] | 64.0 | 62.7 | 62.1 |
| Unemployment (millions)[4] | 2.7 | 2.5 | 3.3 |

p = preliminary r = revised

Sources: 1. McGraw Hill Dept. of Economics (1950 = 100); 2. U.S. Federal Reserve Board (1947-49 = 100); 3. U.S. Dept. of Labor, Bureau of Labor Statistics (1947-49 = 100); 4. U. S. Dept. of Commerce, Bureau of the Census.

**Inventories of unsold cars could become a problem, too.** Right now it looks as though the clean-up of late 1955 models will be orderly. But the situation could change, almost overnight. Dealers now have about one month's supply of cars on hand.

•

**Construction is definitely a plus factor in the business outlook.** As we've predicted right along, new homebuilding has been setting records month after month. Now it is slowing down a bit — running at a rate of about 1.3-million new housing starts a year instead of 1.4-million. But one thing is certain: 1955 will still be the best year ever for the industry.

**Public and commercial construction is marking up just as impressive records as new homebuilding.**

*Proposed* new construction for all sorts of public and commercial structures — roads, sewers, bridges, shopping centers, etc.—is even higher, in some cases over 60% above a year ago.

*The continuing boom in new construction will keep the demand for building materials — lumber, cement, glass, and especially structural steel — strong, well into 1956.*

# LOOKING AHEAD IN LABOR

**Conflict over labor policy in Eisenhower Administration inner circles is breaking out again.** It's a repeat of a situation that caused a fair amount of trouble a year ago—and with practically the same cast of characters.

**The current dispute centers around a candidate for the National Labor Relations Board to succeed retiring Chairman Guy L. Farmer. Involved are politics—and principles.**

Pitted against each other are liberal and conservative elements within the Administration—represented by Labor Secretary Mitchell and Commerce Secretary Weeks. They're pushing their own candidates for the NLRB job—and each of them is fighting the other's choice.

*Reason for the determination on both sides is the highly-sensitive job of the NLRB. The five-man agency interprets labor-management rules of Taft-Hartley—rules that are vague enough to permit almost any sort of interpretation dependent on whether the Board member might lean in sentiment toward labor or management.*

The successor to Farmer will fit in between two Democratic holdovers and two Eisenhower appointees. The Board members usually aren't split along party lines, but there are divisions among the four remaining members that make the fifth member—and his philosophy—important. That's the reason behind the Mitchell-Weeks tangle over filling the job.

•

**These are the front-running candidates for the NLRB chairmanship, together with their supporters and chances at this time:**

• **Stuart Rothman,** Solicitor of the Labor Department. Rothman is a member of the Mitchell team and the Labor Secretary's first choice. But he's strongly opposed by Weeks and management groups. Despite his liberal label, Democrats on the Senate Labor Committee—which passes on the candidate—aren't enthusiastic because of his testimony on the new minimum wage law during committee hearings. Prospects—slight.

• **Michael Bernstein,** Counsel to GOP members of the Senate Labor Committee. He's backed by Weeks as he was for the last NLRB vacancy. That time Mitchell made a direct appeal to President Eisenhower to keep Bernstein out. It worked then, and probably will again.

• **Dwyer Shugrue,** New York Attorney and former aide to N. Y. Senator Irving Ives who's supporting him for the job. Shugrue also missed last time. His prospects dropped when another Ives man recently took an Administration position.

• **Edward McCabe,** Counsel for the House Labor Committee. A long-time House GOP staffer, McCabe has the support of Republican and some Democratic members of his committee. There 's not much opposition, nor support outside the House—but he can't be ruled out.

**Watch these choices.** If one succeeds, you can get an idea on future NLRB decisions and which way they'll go. But also look for a possible dark-horse. This was the solution last time when both sides settled for an "unknown"—former South Dakota Judge Boyd Leedom.

•

**The NLRB, under an Eisenhower-appointed majority, has pushed through a number of policy changes during two years in office.** But there are other key issues still up in the air. The Board has made partial rulings on some of these, and others have been challenged by the courts, so they'll be up for review.

Among the still-unsettled issues are whether an employer can demand a strike vote on the part of his employees; whether employers can agree to a union demand to practise illegal secondary boycotts; what constitutes "disloyalty" to a company on the part of a union member.

Bear in mind, too, that the Supreme Court will pass on many important Board rulings at its next session. High-court decisions may change many past practices either permitted or barred by NLRB.

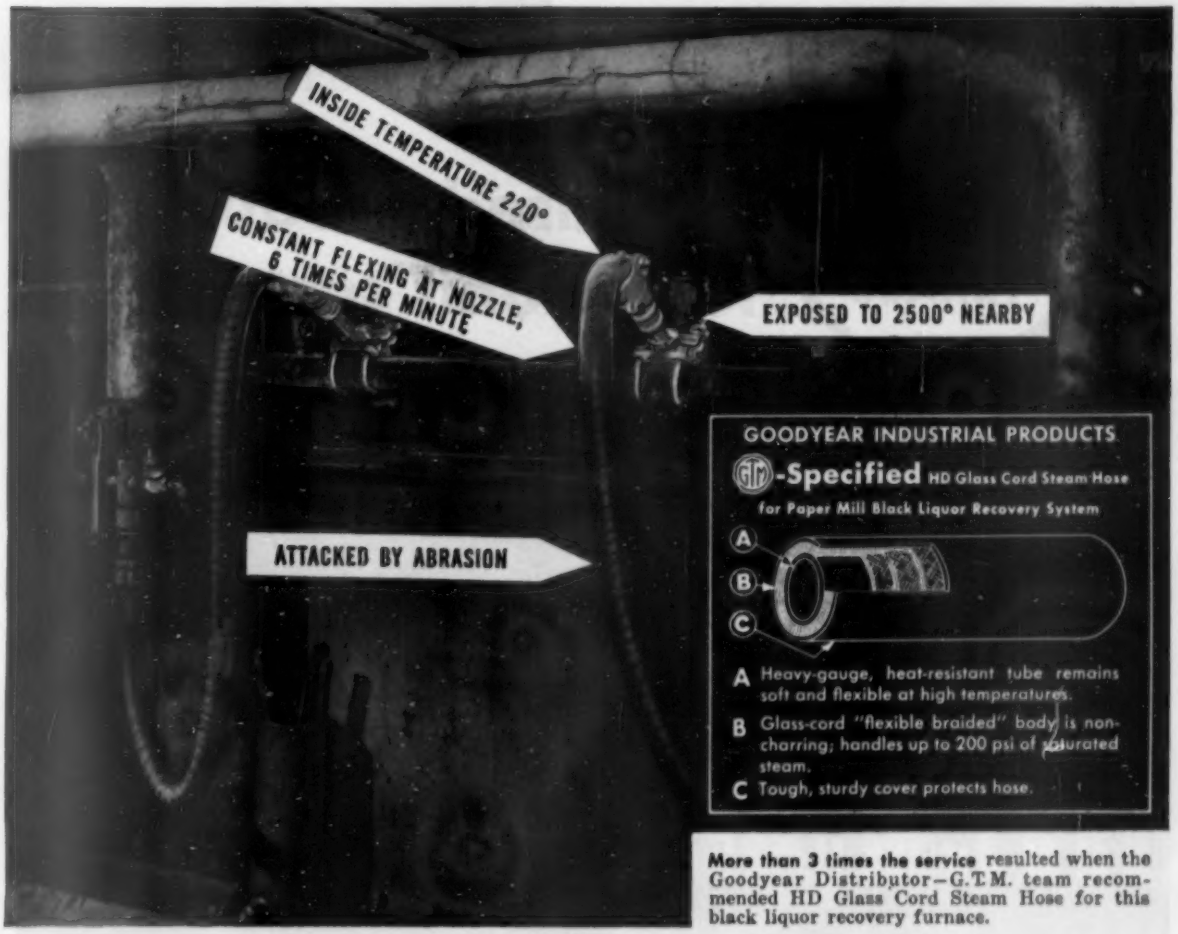
•

**The last stumbling block to AFL-CIO merger has been removed, but it won"t settle all the problems that have arisen because of the coming alliance.**

The decision to use both AFL and CIO as the name of the new merged organization cleared away the final big dispute so the two unions can merge in December. But troubles remain.

*These troubles include continued raiding on the part of some unions, particularly by the AFL teamsters who refuse to subscribe to the no-raiding agreement. Also some AFL unions are raising serious objections to the binding terms of the new AFL-CIO constitution. And several others just don't like the idea of the team-up. The objections won't prevent unity from coming, though.*

SEE LABOR RELATIONS NEWS, PAGE 206


INSIDE TEMPERATURE 220°
CONSTANT FLEXING AT NOZZLE, 6 TIMES PER MINUTE
EXPOSED TO 2500° NEARBY
ATTACKED BY ABRASION
GOODYEAR INDUSTRIAL PRODUCTS
GTM-Specified HD Glass Cord Steam Hose
for Paper Mill Black Liquor Recovery System
A
B
C
A Heavy-gauge, heat-resistant tube remains soft and flexible at high temperatures.
B Glass-cord "flexible braided" body is non-charring; handles up to 200 psi of saturated steam.
C Tough, sturdy cover protects hose.

**More than 3 times the service** resulted when the Goodyear Distributor–G.T.M. team recommended HD Glass Cord Steam Hose for this black liquor recovery furnace.

# Quick cures for hose headaches

## *come from your Goodyear Distributor*

If you have a problem handling anything pumpable – wet or dry, hot or cold, smooth or abrasive –your Goodyear Distributor is the man to call.

From over 800 different combinations of rubber, reinforcement and fabric in production, he can select the hose that fits your job requirements best. And should you and he be faced with a special problem he can always call in the G.T.M. – Goodyear Technical Man–for expert help. That goes for Hose *and* for V-Belts, Flat Belts, Packing or Rolls, too.

But getting precisely the right rubber product for your job is just one of the reasons why it pays to deal with your Goodyear Distributor. Your paper work costs drop because *one* order–*one* bill–is all you process. And your inventory costs drop because he carries the inventory and gives you fast delivery anytime.

Your Goodyear Distributor is listed in the Yellow Pages of your Telephone Directory under "Rubber Products" or "Rubber Goods." Call him today or write Goodyear, Industrial Products Division, Akron 16, Ohio.

**GOODYEAR**

**THE GREATEST NAME IN RUBBER**

*We think you'll like THE GOODYEAR TELEVISION PLAYHOUSE–every other Sunday–NBC TV Network*

THE TOUGH JOBS GO TO TEXACO

# Result: increased production, lower unit costs

ONE EXAMPLE: For the past five years, Teale Machine Company, Rochester, New York, has been using *Texaco Cleartex Oil* as machine lubricant and cutting oil. Machines run twenty-four hours a day, six days a week—cutting brass, monel, free machining and stainless steels. Results have been—

**—more pieces produced between tool grinds**
**—better finish**
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# What Wage Guarantees Will—and Won't—Do

**SPECULATION CONTINUES** about the effects of guaranteed annual wage plans or, more accurately, layoff penalty pay plans (see July FACTORY, page 130). You can spot the interest and uncertainty in the subject at every level in most plants today.

In view of this interest, we think the following comments are of particular import. They highlight some key ideas that haven't been given much publicity, but deserve attention. The source is Ernest G. Swigert, president of the Hyster Company. Mr. Swigert says:

"One fallacy is that the guaranteed annual wage 'won't work.' That is completely wrong. It *will* work. We operate a plant in Holland where we have not only a guaranteed annual wage but virtually a guaranteed lifetime wage. We also have all wages and working conditions established by the government and complete security from the cradle to the grave—and the net result is an hourly wage of less than 25 cents an hour.

"The one thing which seems to me completely clear, which I have yet to find in the voluminous literature on the subject that has come over my desk, is this:

**"Whatever the guaranteed wage is, it has got to be less than the wage would be if it were not guaranteed. No one can alter this fact."**

## Coming—More Pressure to Cut Costs

**WE SUSPECT** lots of readers will deny that it is possible to exert any more pressure to cut costs than is now being exerted on them personally. In some cases that may be true, but in lots of others it seems to us that even more heat's coming.

Oddly, that's because business is so good. Here's how it works: Things are now going along great guns in what our Economics Department calls the "Happiness Phase." That means practically everybody's happy about sales and few have yet begun to be really worried about costs.

**However, with some basic prices already up or going up, chances are excellent that before the year is over, worry over costs will outweigh happiness over sales.**

No preaching intended — but now's the time to get ready for cost-reduction pressure. Or rather now's the time to accent it, since it's a constant job. Meanwhile, we'll be helping with lots of cost emphasis in every issue.

## Moving Ahead in Engineering Education

**PRACTICALLY** everybody who talks about the future makes the point that manufacturing plants will be more complicated, and that broader engineering training will be demanded. It is encouraging to find that engineering schools are now beginning to anticipate future industry requirements. For example:

Production Editor Bob Rice passes on an announcement from the University of Michigan of three new curricula offering degrees in Science Engineering, Nuclear Engineering, and Instrumentation Engineering. The science engineering course is an undergraduate course started last year. The principal aim is to turn out a really flexible graduate who is soundly prepared to move into a variety of specialties, depending upon his later needs.

The courses in nuclear engineering are at the graduate level. The first is obviously needed as great strides in industrial use of atomic energy continue to be made. Instrumentation engineering ties in closely with growing interest in automation and advanced mechanization.

Associate Editor Carroll Boyce points out that Massachusetts Institute of Technology is similarly looking ahead, and developing programs aimed to provide the maximum in flexibility. Newest thing at MIT is what's called "Course 21." Like Michigan's Science Engineering course, it turns out broadly trained engineers who can move in any one of several different directions with relative ease.

All this is to the good. Seems to us more universities ought to follow the example of Michigan and MIT in moving from talk to action in adjusting curricula to changing demands of science and industry.

(For another advance in engineering education—at Harvard—see page 79.)

## FACTORY Now Has a "New Look"

**THINGS MAY LOOK** a little different to you as you read FACTORY's editorial pages this month. That's because we are just beginning to use a brand-new array of fine type faces for our headlines and body text. These faces are noted for their exceptional legibility, and also have well-deserved reputations for handsome appearance.

Purpose of the change is to make FACTORY even easier to read, so you can get more ideas per unit of time. Happy reading!

**ONE MAN IN CONTROL PULPIT** at new Heinz warehouse identifies product, selects proper pallet-loading pattern by pushing a button corresponding to size of case. Cases move into pallet-loading machines at rate of approximately 25 cases per minute. An electric-eye counter stops all loading operations when required number of cases has passed through.

# New High in Warehousing

**Automatically controlled conveyors and a fleet of fork trucks team up with palletizers to mechanize operations in H. J. Heinz Company's big new warehouse.**

**NOW WE'VE SEEN** the warehouse of tomorrow. In operation today. At H. J. Heinz Company's Pittsburgh plant.

In it, 17 automatically controlled conveyors, four pallet-loading machines, 33 fork trucks. All tied together in a handling system. Like a railroad.

**Result: fully mechanized operations. From case-sealing machines in nearby buildings to shipping docks in the warehouse.**

**Benefits** — The new warehouse handling system has proved to be fully practical from the standpoint of proper return on the capital investment. It has eliminated rent for outside storage, also the extra costs resulting from shipping to and from outside warehouses. And it has replaced manual labor with mechanized handling of pallet-loading units exclusively.

This new system—engineered and installed by Lamson Corporation, Syracuse, N. Y.—sets new standards (in our opinion) for efficiency in handling large volume.

Completion of the Heinz warehouse and handling system has centralized operations that had grown until storage facilities included six buildings in different locations in the Pittsburgh area.

**Maximum usage**—The new warehouse, which is 500 feet long and 250 feet wide, provides a storage area of approximately 375,000 square feet on three floors. With a ceiling height of 25 feet and floor-load capacity of 750 pounds per square feet on the two upper floors, pallet loads can be stacked five high. It is therefore possible to store 40,000 pallet loads of products and other materials in the building's 7,400,000 cubic feet of space.

Complete utilization of the cube of the building was obtained by construction of mezzanine office space on the second floor directly over the car-loading area paralleling the Pennsylvania Railroad siding—where space could not be used readily for product storage. These offices are used by local sales branches and for service facilities for the warehouse—such as pallet repair and miscellaneous storage.

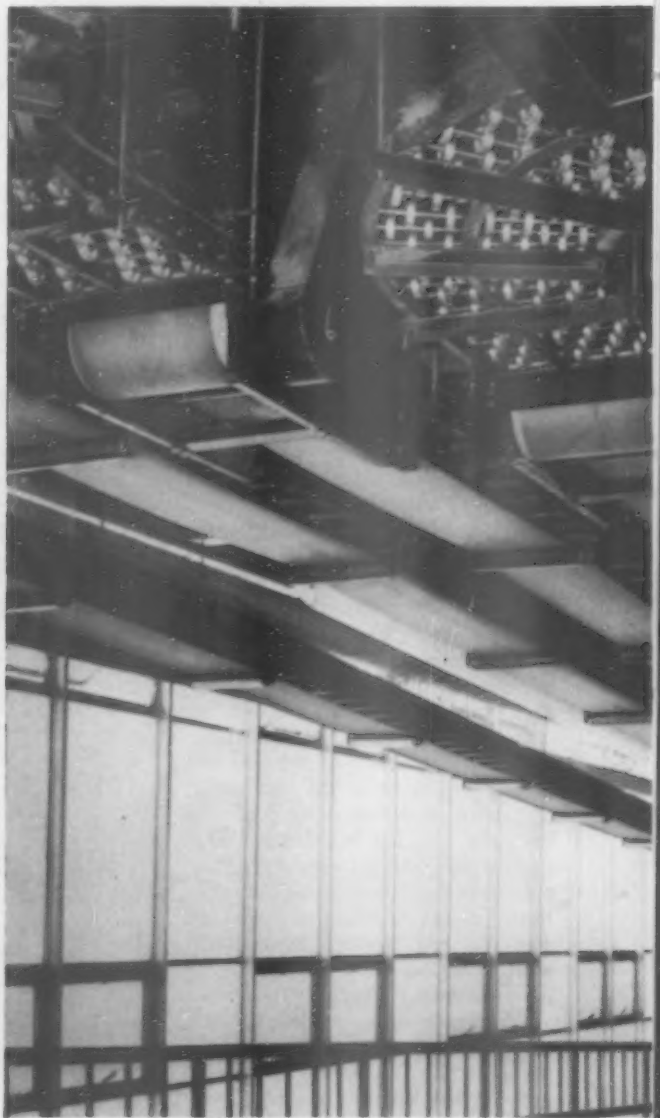
**MAXIMUM UTILIZATION** of storage space was goal. Heinz got it by spacing columns to accommodate standard-pallet size—and by tiering five high.

**Like a railroad**—The advantages offered by the latest developments in automatic mechanization of handling were major factors in planning the new warehouse. Its principal feature is the operation of the handling equipment. This is similar in some respects to switchtower control of railroad trains entering large passenger stations. In fact, the operation involves making up "trains" of predetermined and widely variable numbers of filled cases. Then routing and controlling their movements on 12 accumulator conveyors and five trunk conveyors through four pallet-loading machines. Finally, over other automatic conveyors and vertical lifts to one of three floors in the warehouse.

The number of cases in each "train" is determined by their size. In other words, it's the number needed to fill a pallet to specified dimensions. Average distance traveled on these conveyors is more than

## Complete Mechanization—from Case-Sealers to Shipping Docks

**SWITCHING CENTER** for accumulator conveyors controls number of cases discharged at one time to trunk conveyor. Indicator lamps show operationg conditions on entire system.



**FOUR TRUNK LINE CONVEYORS** carry cases from sealing machines in Shipping Building to warehouse. A fifth runs from Vinegar Building, along with other four, to palletizing machines,

**NEW HIGH IN WAREHOUSING . . .** *Begins on page 68*

1100 feet through two to four connecting upper-floor passageways between buildings. Trunk-conveyor length is about 850 feet. Accumulators average 300 feet, but vary from 240 to 470 feet. There are approximately 1½ miles of conveyors —including feeders, accumulators and trunk lines to the pallet loaders —of which 4100 feet are in trunk lines. Other automatic conveyors deliver palletized products from pallet loaders to the floor on which they are to be stored or shipped.

**Motors** — Conveyors are chain-driven by 183 electric gear-motors of ½ to 2 hp., totaling 156½ hp. There are 52 ½-hp., 61 ¾-hp., 53 1-hp., 5 1½-hp., and 12 2-hp. motors. Each of the four pallet loaders is powered by five motors—one 5-hp., one 3-hp., and three ½-hp. All vertical lifts are powered by 10-hp. motors.

**48,000 cases daily**—There's no manual handling after cases are automatically sealed until they reach warehouse shipping dock or outgoing railroad car or highway truck. Even handstacking in these cars and trucks is to be eliminated when present experimental use of accessories in fork-truck handling shows the most satisfactory mechanized method of recovering pallets.

The new handling system takes as many as 48,000 cases of Heinz products from production lines during an 8-hour shift. And delivers

joining with one of them near one of four pallet loaders. To conserve space, both accumulator and trunk conveyors are located as close to ceiling as possible.

**CASES MOVE** into pallet-loading machine (one of four in warehouse) in loading pattern selected by operator in control pulpit. Pattern is determined by size of cases.

**LOADED PALLET** is picked up by a short conveyor that takes it to a vertical lift, then moved downward and ejected automatically at pre-set floor level onto a terminal conveyor.

them on pallets to conveyor terminals at any of 12 points on the three floors of the warehouse. Loaded pallets are then moved by fork truck from these points to tiered storage or shipping docks.

**One-man control**—Normal operation of the system requires the constant attention of only two men for the conveyors and pallet-loading machines, and some of the 33 fork truck operators. Two electricians and two mechanics are available to keep it running properly. A single operator controls conveyors and pallet loaders. And a second man with a motorized hand truck keeps pallet loaders supplied with empty pallets and serves as a roving troubleshooter. Fork truck operations include three major types of movements of pallet loads—conveyor to storage, storage to shipping docks, conveyor to shipping docks.

To conserve floor space, the 12 accumulator and five trunk conveyors are located as near ceiling height as possible. Conveyors from case-sealing machines on the fourth floor of the Shipping Building and the third floor of the Cereal Building carry the cases up to this level to discharge them on feeder and accumulator conveyors. The 12 accumulator conveyors automatically discharge the case products in predetermined numbers of cases to any of four trunk line conveyors in the sequence in which these numbers of cases accumulate. Trunk conveyors pick up the cases at the end of the Shipping Building.

The switching control center for the accumulator conveyors is located near their junctions with trunk

conveyors on the fourth floor of the Shipping Building. Panel controls here include electrical plug-in cable connections for each trunk conveyor, and multi-contact dial switches to determine the number of cases to be discharged at one time from accumulator to trunk conveyor. These controls may remain fixed for extended periods of time. Also on the panel are indicator lamps that show operating conditions on the whole conveyor system. The panel is enclosed to prevent tampering, but may be observed through a plate glass window from the outside. A three-station inter-communication system with loud speakers connects the control stations, operator's pulpit in the warehouse, and the foreman of operations.

**Standard pallets**—Panel controls permit adjustment of the handling system to the many different Heinz products and sizes of cases that are required in packaging them. Cases range from approximately 8½ x 11 to 13 x 19 inches and from 10 to 50 pounds. Thus pallet loads vary from as many as 210 cases to as few as 24 on a single standard pallet. This is a 40x48-in. double-faced wooden pallet. More than 150,000 are used in Heinz's seven factories and 16 sales branches. Loaded pallets have a maximum height of 50½ inches and weigh anywhere from 500 to 2900 pounds. Pallet dimensions were used as a basis for the spacing of the supporting columns in the new warehouse in order to minimize waste space.

**Accumulator conveyors**—In the automatic operation of the accumulator conveyors, sealed cases are carried on live rollers that are moved by a belt underneath them until they are stopped by a stationary metering belt conveyor that feeds the trunk conveyors.

When a predetermined length of conveyor has been filled, the last case rests on a time-delay switch long enough (5 seconds) to close a signal circuit to the panel so that a metering belt will be energized. As soon as the trunk conveyor on which this accumulator discharges is cleared of cases from any other accumulator that has had priority, the metering belt is started. The cases then pass an electric eye and are carried onto a deflector belt that passes over the top of the four conveyors. A manually positioned deflector pushes the case off onto a selected trunk conveyor belt running at right angles to it. When the predetermined number of cases passes the electric eye, the metering belt stops. Only enough to fill a pallet goes past this point.

Although as many as five accumulator conveyors may feed onto a single trunk line, at present each is fed by three accumluators. As soon as one train of cases goes on the trunk conveyor, another train from another accumulator that has been set up starts moving.

**Conveyor speeds**—These conveyors operate at different speeds. Accumulators move at the rate of 65 feet, metering belts at 50 feet, deflector belts at 150 feet (thus spacing the cases and giving them adequate momentum to pass the deflector) and trunk conveyors at 100 feet per minute. In the event of a jam on the accumulator, which would close the circuits calling for energizing the metering belt, those cases that are free to move onto the trunk are moved all the way into the warehouse. But no other accumulator can feed onto the trunk conveyor until trouble is cleared.

**Five trunk lines**—Four trunk conveyors carry the cases from the Shipping Building through a passageway into the Power Building and adjoining Vinegar Building (second floor), through another passageway into the warehouse. A fifth trunk conveyor runs from the Vinegar Building along with the other four to the palletizing machines, joining with one of them near one of the four pallet loaders. In the warehouse the cases move up an incline to an elevated level over the top of the four pallet-loading machines on the third floor.

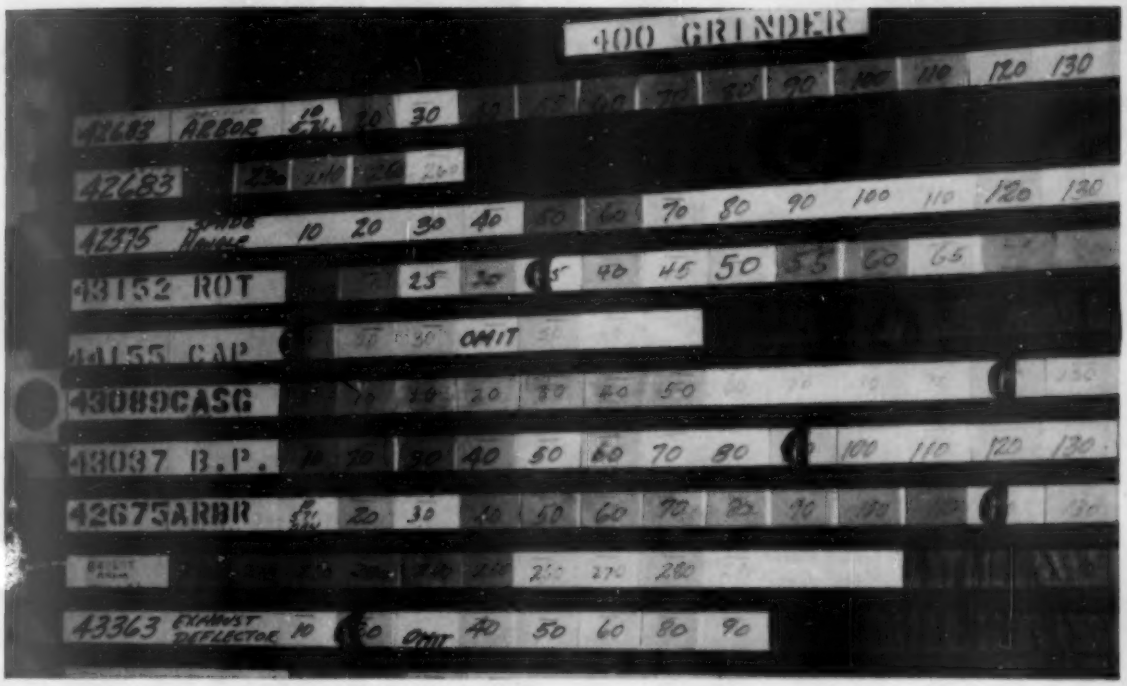
**Pallet loaders**—As each succeeding train of cases is ready to move into a pallet-loading machine, a signal lamp is lighted in the operator's control pulpit. The operator identifies the product and selects the proper pallet-loading pattern by pushing a button corresponding to the size of case for this product. This also permits the cases to move into the pallet-loading machine. Cases move into the machine at the rate of about 25 per minute. And an electric eye counter stops all loading operations when the required number of cases has passed through.

In the control pulpit the operator has one or more pushbuttons and three-position switches for every size of case used. Although the four machines are identical, they are set up to handle a limited range of overlapping sizes. The pushbutton actually selects one of several relay control units or "cartridges" on each machine. They automatically provide for the sequence of operations that will load the pallet in the desired pattern for a given size and shape of case. The switch determines the floor-level destination of the loaded pallet.

**Automatic lifts**—As the loaded pallet is ejected from the machine, it is picked up by a short conveyor that takes it to a vertical lift on which it is moved downward automatically and is ejected automatically on reaching the pre-set floor level onto a teminal conveyor from which fork trucks can remove it. If the pallet load is to remain on the third floor, it moves automatically through the vertical lift shaft to a terminal conveyor from which fork trucks can remove it.

**33 fork trucks** — Fork truck handling equipment includes 18 battery-powered high-lift trucks, 5 battery-powered low-lift trucks, 4 engine-powered low-lift trucks, and 6 motorized hand trucks. The trucks operate on concrete floors in aisles 12 feet wide.

**Loading docks**—Twelve car spots served by the B & O Railroad on the south side of the building are accessible to the first floor. And 15 car spots served by the Pennsylvania Railroad on the north side are accessible to the second floor. On the west end of the building there are garage facilities and truck-loading docks for 22 local delivery trucks. There are 24 spots for highway trucks on the east end of the warehouse, 10 are accessible to the first floor and 14 to the second floor. Sixty box cars and 69 highway trucks can be loaded daily. Normal two-shift operation provides for loading 30 box cars and 35 long-haul highway trucks daily.




**CONTROL BOARD** at Cleco Division is coded, shows status and priority of every job in the plant.

# Why Write Shop Orders?

**You'll want to switch to a visual control board after you've read how this Texas concern keeps tab on 5000 different parts produced on 300 machines.**

**NO NEED** to put production orders in writing. Not if you follow the control plan used by Cleco Division, The Reed Roller Bit Company, Houston. Cleco did away with written orders. Uses instead some strip-loading wallboards (photo above) in a 15x15-ft. Information Center (small picture). The Center is smack in the middle of the 90,000-sq.-ft. plant.

S. E. Rees, production manager at Cleco, says the system works well. Here's why:

*. . . No hunting for lost orders.*
*. . . Better delivery estimates.*
*. . . No "mechanical costs."*
*. . . No paperwork.*
*. . . Less expediting.*

Color-coded flags placed at left-hand end of strips show relative priority of orders: red bullet on white, "Rush"; yellow diagonal on red, "30 Days"; solid red, "60 Days."

Operations also are color-coded

**INFORMATION CENTER** tells foremen—at a glance—what's coming up, how to plan the day's work

—by departments. When order first reaches production control, each operation number is shown on a small card in color corresponding to department that performs operation. These cards are stapled together in a strip, inserted on the board.

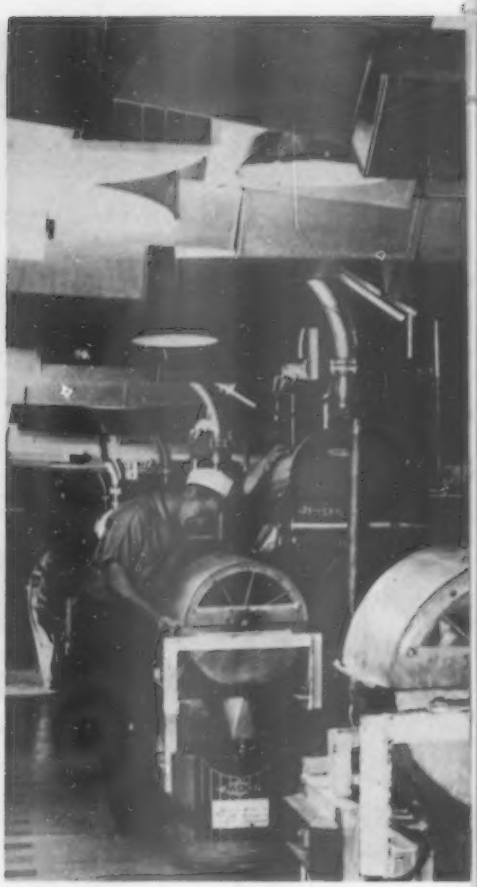
Twice a day inspectors—not foremen—tell the Center about completed operations. The Center advances small metal clips on the board to show orders ready for next operation. If an emergency requires a split order, a second clip is used by the Center.

Every foreman checks at the Information Center each morning—oftener if necessary. He spots his color on the operation tickets. Metal clip shows work ready for his department. Priority flag tells him how to organize his day's work. He jots down essential facts on a simple form — a brief memo to himself — and takes it back to his workplace. The system keeps him looking ahead at least one operation.

Detailed operating and set-up instructions move through with raw material in a standard factory traveler (route card).

Finished and inspected material is moved quickly to the "next operation" department.

**NOISE ABSORBER** is a diamond-shaped box of perforated aluminum with glass-fiber insert. Unit weighs only 2½ pounds — but it drinks up lots of noise.



**CUTTING-ROOM DIN** was halved after 312 sound soakers were strung on

# Bedlam? Try Sound Soakers

**Dow did it at its Gales Ferry (Conn.) plant. And you'll want to, too — we think — when you learn how these flyweight aluminum boxes soak up process din.**

**FOR SHEER BEDLAM** our plastic strand cutting room copped all the prizes — before we did something about it.

In an otherwise quiet factory like ours, this department stood out in noisy contrast. Bothered the men who worked there. Cut our efficiency. Plagued us with production mistakes. Over-all decibel reading was 107.

But now it's 96 decibels. This is better than a 50% loudness reduction — as sensed by an average ear.

It cost us some $2600 to provide this noise reduction. Did it pay? Nobody will ever be able to muster bookkeeping figures to prove it. But you'll agree it paid off — and may want to try it in your own plant — if you add up these benefits:

. . . *Employee goodwill has grown.* That's always a factor in better labor relations.

. . . *Workers now can communicate* intelligibly inside the room, avoid production mistakes.

. . . *Possible hearing losses*—from long exposure to noise—don't worry us as they did before.

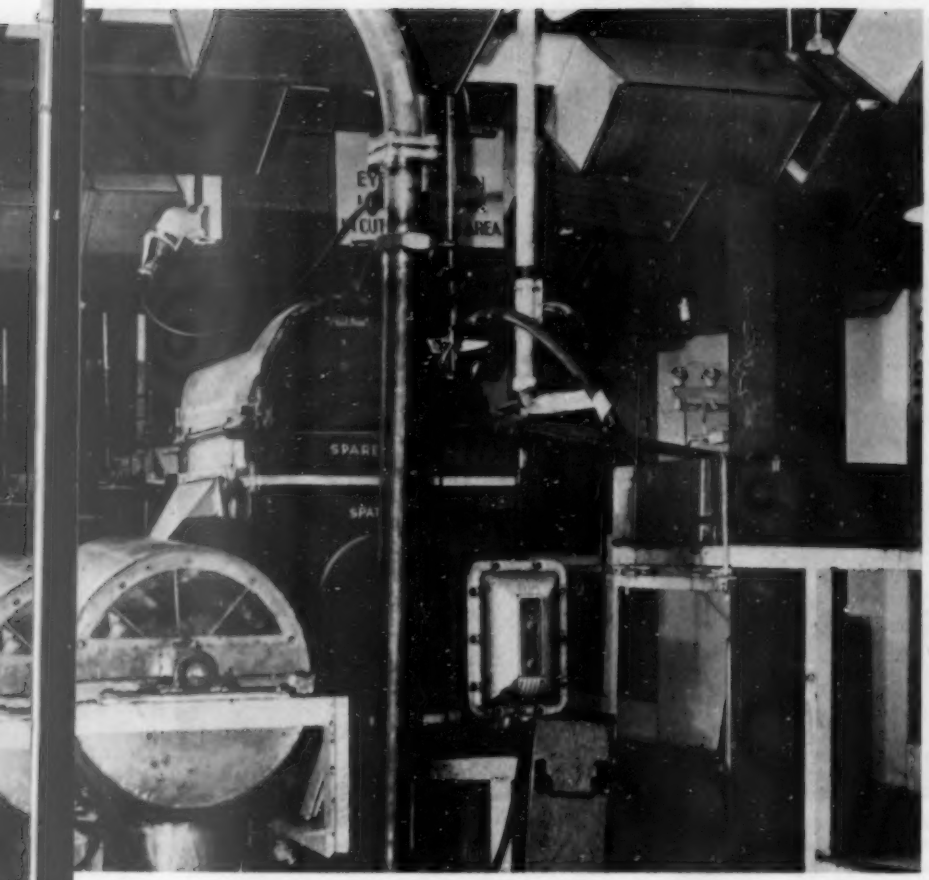
. . . *Employee morale is higher.* It's reflected in less absenteeism, better efficiency.

By K. E. STOBER, Plant Manager
Allyn's Point Div., Dow Chemical Co.
Gales Ferry, Conn.

## PROBLEM

We really had a tough one. Here was a room 126 feet long and 21 feet wide, with a 12-ft. ceiling. Operations were around-the-clock. Surfaces of walls, floor, and ceiling were of smooth-finished concrete.

It was a regular cave, bouncing noise from the cutting machines all day long—all over the place. Before noise-reduction treatment, unless people had extremely urgent business there, they stayed away.



wires below the ceiling. Now workers can hear each other. Installation was made with less-noise-or-no-pay guarantee. Results were 10% better than predicted.

## SOLUTION

We knew something had to be done to reduce the noise level. In our search for ways to do it we came across the Sonosorber method, as engineered by Elof Hansson, Inc., New York City.

The Sonosorber is a diamond-shaped box—12 x 12 x 24 inches—made of perforated aluminum skin with a special glass-fiber insert. This design, we were told, provides a larger sound-absorptive area than the ceiling and wall area. Thus it was especially applicable where large-volume noise exists—as in our plant.

Hansson engineers surveyed the problem and recommended we install 312 Sonosorbers at about 3-ft. centers in a geometrical pattern over the area. With this plan went a guarantee, for us, of a 10-decibel over-all reduction in noise. And if this reduction were not realized, the installer was to be permitted to install more units—at no extra cost—to reach the goal. Failing this, all Sonosorbers were returnable at no cost. What could we lose?

To make sure the noise reduction was impartially and accurately determined, we agreed on a reputable independent consultant. He took a number of sound-level readings together with a frequency analysis at several locations within the room. A full report went to both parties.

**Easy installation** — Our own maintenance personnel did the installation job in our plant. The units came unassembled, 25 in each box.

The plan was to install all units at one go—to achieve maximum psychological effect. So all the units were first assembled outside the cutting room.

In the meantime, within the room light-gage steel wires were strung from wall to wall about 11 feet from the floor. Small wire clips were fastened to these wires to receive the suspension tabs of the Sonosorbers. Since each unit weighs only 2½ pounds, load capacity and method of hanging created no problem for our installation men.

Our plans for a one-shot installation fell through. After some 150 units were hung in place the maintenance crew had to jump to an urgent job. It was then we got our first reactions to the effectiveness of the noise-reduction treatment. The cutting-room operators asked us not to postpone hanging the remaining Sonosorbers. They found that the area already treated was much improved—and they wanted the benefit of the whole works.

When all units were in place, the consultant took new sound-level readings in the same locations and under similar operating conditions. His report, covering all frequencies, showed an over-all reading of only 96 decibels—an 11-decibel reduction, or 10% better than we had been led to expect—as follows:

**NOISE REDUCTION**

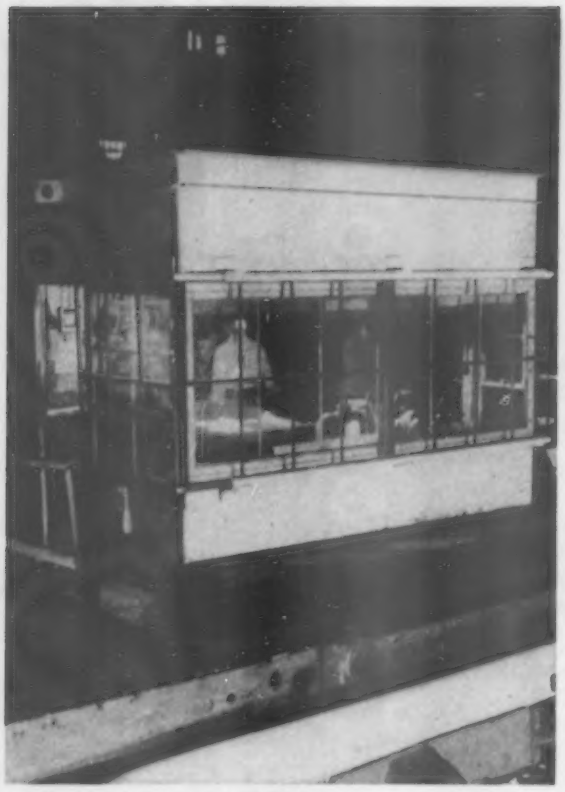
| Frequency (Cycles per Second) | Decibel Level Before | After |
|---|---|---|
| 37½-75 | 80 | 80 |
| 75-150 | 90 | 79 |
| 150-300 | 96 | 88 |
| 300-600 | 103 | 91 |
| 600-1200 | 104 | 89 |
| 1200-2400 | 104 | 90 |
| 2400-4800 | 103 | 88 |
| 4800-10,000 | 92 | 75 |
| Over-all | 107 | 96 |

**Other benefits**—Our Sonosorber system has many plus values. We were able to install the whole system easily and quickly without interrupting production. Ceiling configuration didn't affect the cost.

The system is fire-safe, has good light-reflective properties. The units do not interfere with other important services—lighting, ventilation, heating, sprinklers. And dust, oil, or moisture do not impair their acoustical efficiency in any measurable degree.

If we ever make layout changes it will be easy to transfer the units. Maintenance upkeep is moderate. Vacuum cleaning every six to eight months, and washing the aluminum surface every two to three years—that's all that's needed.

**ALUMINUM SHIELD FENCE** protects worker from most of radiant heat, doesn't hide annealing operation. Overhead double hood for carrying off fumes, gases, also has aluminum shield.



**INFRA-RED REFLECTIVE GLASS** installed in front of conventional glass provides transparent shielding for this rolling mill control pulpit, reduces radiant-heat reaching interior.

# Hot Jobs Will Be Cool Jobs

**Cooler, anyway—if you use radiant heat shielding. Often a nickel's worth of shielding can keep a worker just as cool as a dollar's worth of ventilation.**

**PHOTOS ABOVE** show you practical, effective examples of radiant heat shielding in five different plants. These installations are making the plants better and more comfortable places to work, at a cost that justifies the attention of any plant operating man with "hot spots" in his plant.

**What is radiant heat shielding?**—It's the placement of a barrier of heat-reflective material between a source of radiant heat and surrounding people or objects. It works like an aluminum roof, which reflects the sun's radiant heat, keeps inside of the plant cool.

By WARREN J. KING
Western Editor, FACTORY

**What can radiant heat shielding do for you?**—First, shielding improves working conditions in "hot spots" caused by radiant heat.

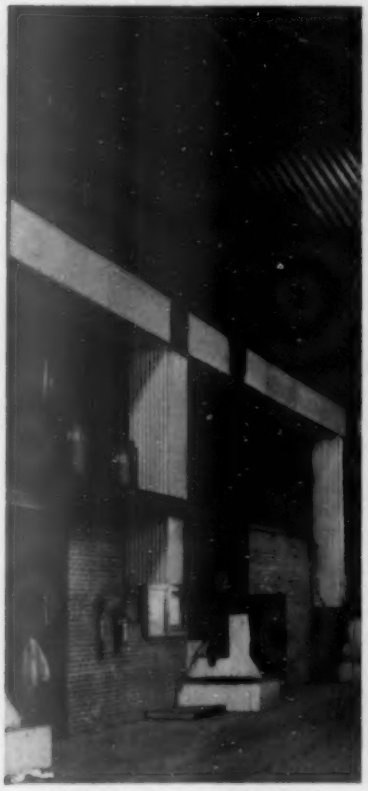
Second, it increases the life of motors and other electrical equipment by protecting them from harmful excessive heat.

Third, it reduces the heat load on isolated air-conditioned areas such as crane cabs.

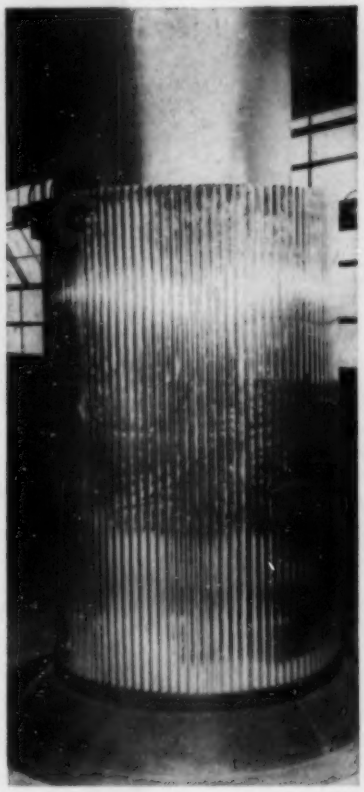
Shielding is the cheapest way to fight radiant heat. True, insulating the heat sources is another control method. But that's usually more expensive, and limits the accessibility of products and equipment to production and maintenance workers.

**What materials are used for shielding?**—Any solid material will block the straight-line travel of radiant heat. However, most materials absorb rather than reflect radiant heat—which makes them secondary sources. Using such materials, of course, defeats the purpose of shield or screen.

The best shielding materials have two strong points. First, they reflect a major portion of the radiant heat and do not retain much heat in the doing. Second, being poor radiators,



**ELECTRICAL MAINTENANCE** was cut by this aluminum shielding. Protects pipe and conduit from process heat.



**TUBE-LIKE SHIELD** screens workers near this glass-furnace stack. It's a few inches from stack, causing draft cooling.

**REFLECTIVE APRONS** provide radiant heat protection for operators above. Made of paper-backed aluminum foil.

they emit little of the heat they do retain. Polished surfaces, such as bright aluminum, provide 95-97% heat reflectivity, and have an emissivity rate of only 5-3%. Rust, tarnish, and oxide coatings reduce a shield's effectiveness. Some of the best materials for shielding: aluminum, coated steel, tin plate, and nickel.

Aluminum pigment paints with silicone or modified silicone bases have good reflective properties; as high as 60%. Surfaces coated with such paints make reasonably good shields.

For personal shielding, special reflective clothing, and even reflective facial creams are on the market.

**Where and how should shielding be used?**—Here are four suggestions:

. . . 1) *Shield should block* all straight-line paths between heat source and object or person requiring protection. Thus, completeness of shielding determines its success.

. . . 2) *Shield should not have* physical contact with the heat source. If it does, shield is also heated by conduction. And ventilation passage between shield and source is reduced or eliminated. And thus the benefits of convectional draft cooling are lost.

. . . 3) *Shield should be* highly reflective. But take care that when you eliminate one condition you do not raise another. The shield, in doing its job, reflects heat back to the source area, thus increasing this area's temperature. This means you have made conditions worse for the men who are working at or near the radiant heat source.

. . . 4) *Shield should never interfere* with an area's natural ventilation. If it does, the increase in convected heat—heated air currents—may more than compensate for the reduction achieved in radiated heat.

**How effective is shielding?**—According to tests made by the Aluminum Company of America on an open-hearth furnace used for remelting aluminum, it's mighty effective. Before installing shields, the furnace's outer casing — with a surface temperature of 280 degrees F. —radiated a goodly amount of heat to the surrounding area.

Then a 1/16-in. sheet of mill-finish aluminum was placed 6 inches in front of the furnace. The outer surface temperature of the aluminum shield stabilized at 85 F. only 19 degrees above the room temperature (66 F.).

The temperature of the room air passing between the furnace and the shield rose 25 degrees. This chimney effect helped keep the shell of the furnace at 290 degrees F.—only 10 degrees higher than its original temperature.

Thus workers in the area were effectively shielded from radiant heat. And at the same time the brickwork shell temperature of the furnace was raised only about 10 degrees — not enough to affect the furnace in any way.

# FACTORY | IDEAS OF THE MONTH

By LEWIS K. URQUHART, Managing Editor, FACTORY

**Big job coming up?** Need temporary help in a hurry? Smart managers these days are picking up the phone and calling Manpower, Inc. (it has offices in 48 cities). Or writing to 330 W. Kilbourn Ave., Milwaukee 3.

**Qualitrule** is a new circular sliderule designed by American Hydromath Corp. (25-20 43rd Ave., Long Island City 1, N.Y.) as an aid and comfort to plant men with quality control problems on their minds. $4.95. And a real time-saver.

**Safety directors** will give three rousing cheers when you hand them their free copy of "1955 Occupational Services Guide." It describes National Safety Council's full line of posters, films, and booklets available to sell safety to the man on the job. Address NSC at 425 N. Michigan Ave., Chicago 11.

**Automatic card rack** newly introduced by International Business Machines Corp. (590 Madison Ave., New York 22) picks up timecards in sequence in a single upward movement of a lightweight, free-moving "collector." Can be locked in static position at the base of the rack to prevent unauthorized use.

**Modnar** is a random-plank asphalt tile by TILE-TEX (1232 McKinley Ave., Chicago Heights, Ill.). Four flavors—driftwood, oak, maple, walnut.

**Clearprint** drawing and tracing paper now comes in 20-, 50-, 100-yd. rolls, and in widths from 24 to 42 inches. It's the paper with the light-blue cross-section rules that completely disappear on direct-print reproduction or blueprints. Clearprint Paper Co., 1482 67th St., Emeryville, Calif.

**Ammonia leaks?** Get one of those little books of test papers offered free by Nitrogen Division, Allied Chemical & Dye Corp., 40 Rector St., New York 6.

**Phone mate** holds telephone receiver and mouthpiece at head level, leaves hands free to write, type, light cigarettes, or wave in the air. Pioneer Equipment Sales Co., 234 E. Colorado Blvd., Pasadena, Calif.

**Seen those new colored-coded** acetate holders? Made by Baw Co., 9704 Frankstown Road, Pittsburgh 35. With taped edges in five different colors. Wonderful for routing factory paper—and keeping it clean.

**Now a model kit** permits you to make an exact one-third scale version of scaffolding, ramps, work platforms, movable bins, etc.—all the things you can erect with angle steel bars. Structo Systems, Inc., Elyria, Ohio.

**Booklet of the month** is a new 32-page booklet that tells the user "all he needs to know" about porcelain enamel and enameling iron. He'll find sections on design of parts, fabrication, cleaning and pickling, good enameling practice, testing, and crating. Armco Steel Corp., Middletown, Ohio. Free, of course.

**Pipe and conduit gage** (Dayton Rogers Mfg. Co., 2824 13th Ave. S, Minneapolis 7) calibrates sizes of standard iron pipe from ⅛ to 1¼ inch.

**Executive safety goggles** (Watchemoket Optical Co., 232 N. Exchange St., Providence 3) have interchangeable lenses—clear for eye protection from impact, light green for average sunlight and glare, medium green for bright sun and glare. Also available, gold lenses for increased visual acuity.

**Templa-file** contains 24 numbered sliding panels, 36 x 80 inches. Specially designed by De Luxe Metal Furniture Co. (306 Struthers St., Warren, Pa.) for filing and storing templates, patterns, gaskets, and flat tools. Each panel is suspended on rollers operating on a roll-formed track. Occupies less than 25 sq. ft. of floor area.

**Your cleaning program** might be more effective if your v.p. in charge wrote National Sanitary Supply Corp. (139 N. Clark St., Chicago 2) for some of its bulletins and booklets. All kinds of help. All free.

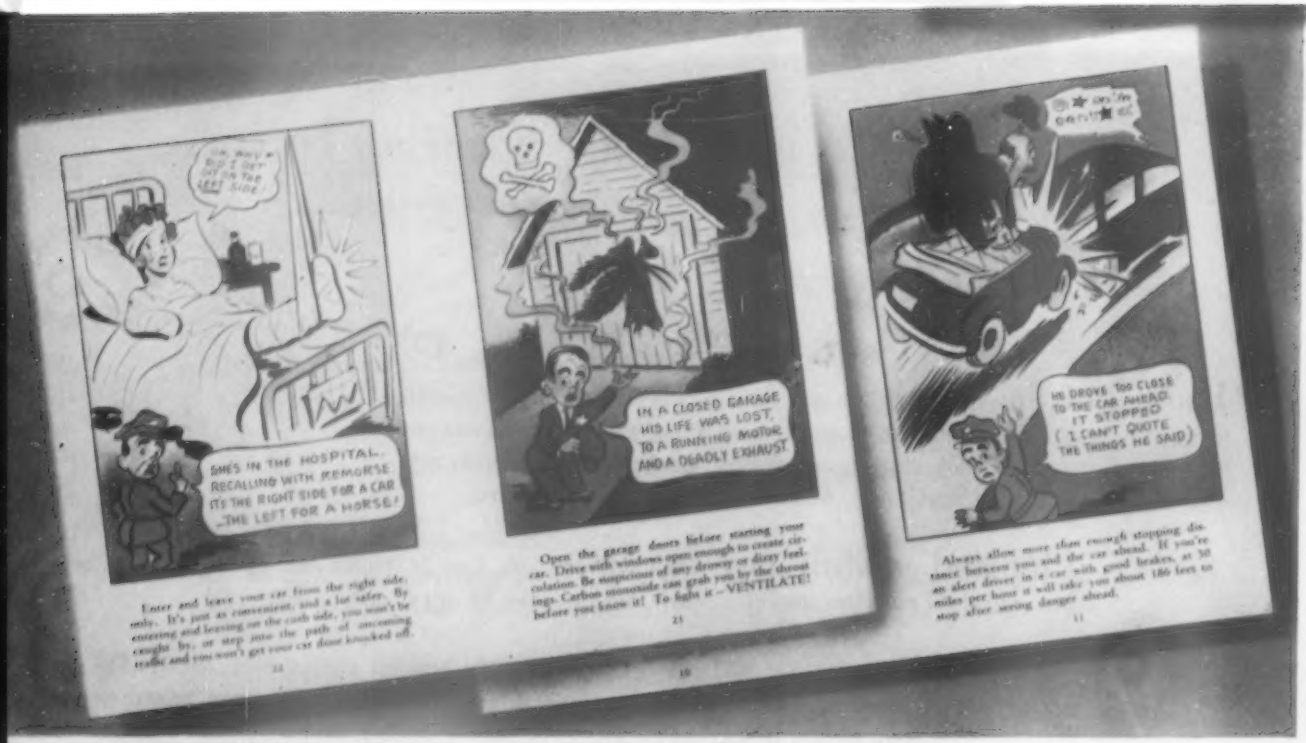
**Moving without marring** is for sure if you coat your lifting device or carrier with a heavy polyvinyl-chloride manufactured by Quelcor, Inc., Chester, Pa.—won't scratch highly finished parts.

**Transeals** cut drafting time by eliminating hand lettering and time-consuming drawing of symbols, title blocks and rules usually required for engineering drawings. Johnson Research Corp., Bethpage, N. Y.

**Harvard is first** to offer a course in control system engineering—automation to you. This fall. For grad students. A one-year course.

**Neo-grip** is a new expansion fastener with a neoprene sleeve that "cushions" the pressure and protects soft or brittle walls from tearing or shattering. Rocket Devices Corp., 142 Liberty St., New York 6. A really versatile fastener. We've tried it. Good for a lot of uses—in plant and at home.

**Fanfold towels** now have self-adhesive spots on top and bottom of each package. Reloading easier. West Disinfecting Co., Long Island City, N. Y.


SHE'S IN THE HOSPITAL... RECALLING WITH REMORSE IT'S THE RIGHT SIDE FOR A CAR ...THE LEFT FOR A HORSE!
Enter and leave your car from the right side, only. It's just as convenient, and a lot safer. By entering and leaving on the curb side, you won't be caught by, or step into the path of oncoming traffic and you won't get your car door knocked off.
IN A CLOSED GARAGE MID LIFE WAS LOST, TO A RUNNING MOTOR AND A DEADLY EXHAUST
Open the garage doors before starting your car. Drive with windows open enough to create circulation. Be suspicious of any drowsy or dizzy feelings. Carbon monoxide can grab you by the throat before you know it! To fight it – VENTILATE!
HE DROVE TOO CLOSE TO THE CAR AHEAD. IT STOPPED ( I CAN'T QUOTE THE THINGS HE SAID )
Always allow more than enough stopping distance between you and the car ahead. If you're an alert driver in a car with good brakes, at 30 miles per hour it will take you about 186 feet to stop after seeing danger ahead.

**COMIC BOOK,** designed by author's company for workers, sells safe driving to the wife and kids.

# Every Worker a Safer Driver

**Here's a new twist that will put some zip into your safety education plans for early fall. And one that's sure to pay off. Doesn't matter, you know, where workers get hurt—plant or highway. Either place, your plant suffers.**

**IT'S NOT ENOUGH** to cut down injuries in your plant. You've got to work toward cutting them outside. Because an injury away from work affects your plant in man-hours lost—and in costs—just like an in-plant injury.

**Take traffic accidents** — How many man-hours were wasted last year because of traffic fatalities and injuries? Well, nearly half of the 38,000 persons who died in traffic last year were industrial employees. And 650,000 people were injured in traffic mishaps. Impressive figures —and costly, too.

Who pays? A good share of the bill comes straight to industry.

That's why the newest trend in plant safety is to look beyond the plant. A recent survey showed us at Employers Mutuals of Wausau that many companies today realize they have to keep their eyes on the road as well as on the plant. And that limiting safety to the plant is only half of the job. For example:

*. . . The Du Pont Company's Old Hickory Rayon Division ran up an enviable record—22 months without an on-the-job lost-time injury.* But in that same period 63 workers lost time because of highway accidents. In all its 119 plants, laboratories, and construction projects, Du Pont discovered that auto accidents cause 30% of its off-the-job injuries.

*. . . A utility company in New York learned that in one year 156 of its employees were injured in street and highway accidents.* These cases cost the company 32,159 man-days. And employees lost $16,521 in wages and salary not covered by insurance.

**What you can do**—Many things. For a good start, try these:

*. . . Educate your workers in traffic safety* while you teach them about plant safety. A little special effort is all you need.

*. . . Give part of your regular safety meeting to some aspect of traffic safety.*

*. . . Pass out literature to your workers* that outlines the problems of safe driving and tells how traffic authorities meet these problems.

*. . . Ask your foremen to distribute printed material* to their workers just before the weekend or to anyone going on vacation.

*. . . Insert leaflets in payroll envelopes*—if your budget permits.

*. . . Show movies on traffic safety.* Plenty are available—at no cost.

By F. W. BRAUN, Vice President
Accident Prevention Department
Employers Mutuals of Wausau
Wausau, Wis.

## Mr. Average Driver isn't good enough

Sure, we need safer highways and streets. But above all we need better drivers. The average driver just isn't good enough. That's the root of the problem. And you must start out with that fact whatever method of safety education you decide to use.

Mr. Average Driver lacks the most important quality needed in skillful driving—what the professional drivers call "defensive driving." It's the ability to avoid an accident caused by the other fellow's driving—the faculty of recognizing hazards while there's still time for you to dodge them successfully.

Since better driving is the root of auto safety, you'll help reduce man-hours lost in your plant by telling your workers the real facts—straight from traffic safety experts. Take just two *false* ideas, for example and look at the facts:

. . . *"Reckless drivers cause most of the tragedies in the streets."* Actually, nearly all traffic accidents come from the unconscious, habit-formed errors of the average driver—not the reckless driver. Most drivers involved in serious accidents are first offenders.

. . . *"There's no need for extra caution on the straightaway."* Fact is, 77% of all traffic fatalities occur on the straightaway.

One word of warning, though: When you pass driving tips to your workers, be careful. Appeal to their pride. All drivers like to think they're professionals. Tell them that if they master the rules of skillful driving they will become pro's—and good ones.

## Try the other fellow's bright ideas

Look for success stories. That way, you may pick up an inspiration for a campaign to promote better driving habits.

Here are some examples of ideas that have paid off:

. . . *Give voluntary driver tests.* The Du Pont Company's Experimental Station, Wilmington, tried them, found they helped. The station learned its workers were involved in nine bad traffic accidents in 1953. Launched a testing program at the end of the year. Set up three testing devices to measure reaction speed, visualization, perception, and other skills necessary for safe driving. Told employees the tests—non-compulsory—were available on the plant ground during working hours.

The test got an enthusiastic reception, says W. L. Andrews, safety director. "Nearly all of our 2700 employees turned out."

Result: Only one bad auto accident in 1954. Management believes the 88% reduction resulted mostly from the driver evaluation test.

. . . *Set up safety displays.* They're only one of several devices Du Pont's Spruance plant, at Richmond, has been using to emphasize traffic safety. It all began just before Labor Day in 1952. As workers left for the holiday week-end they were confronted with display exhibits placed at each plant exit by the plant safety committee. The displays showed safe driving practices and the toll of careless driving. At the gates plant guards and state police handed out attractive pamphlets on safe driving, reminded holiday-bound workers to take it easy over the weekend.

Today at the Spruance plant there are safety reminders everywhere—traffic displays in the cafeterias, cartoon signs along driveways, luminous signs at parking-area entrances and exits. Before holidays a special exhibit is placed at plant entrances. It's built around a wrecked automobile. Through a hidden tape recorder the car "talks" about avoiding such tragedy as befell it. There's also a small earth mound—looks like a grave—with signs quoting famous last words: "I can make it through the yellow light," "I can beat that train to the crossing," "I can do 50 around that curve."

. . . *Snatch every opportunity.* Since its first effort Du Pont's Spruance plant has staged a number of programs to keep traffic safety uppermost in workers' minds; invited city and state traffic authorities to take part in safety meetings; mailed letters and other material to workers; held driver reaction tests; shown traffic movies. For their part, employees have organized a highway safety committee of workers to boost the idea.

Result: Steady improvement in off-the-job traffic mishaps. In 1953 highway accidents killed three Spruance employees, caused 17 major injuries. Through September 1954 there were only two major injuries.

. . . *Stage a safe-driving exhibit.* Union Carbide & Carbon Corporation at Niagara, N. Y., set one up in three tents on company property. In one was a miniature replica of the city complete with street lights and flashing stop-and-go signals. Common traffic violations were illustrated. In another tent, highway safety movies were shown continuously. And in a third there were devices to test a driver's skill and measure his reaction time.

. . . *Set up highway signs.* Parker Pen Company, Janesville, Wis., spotted a cartoon-type outdoor billboard just up the road from its new Arrow Park plant where thousands of vacationers were sure to see it. It had this message: "Drive Slowly! See All of Wonderful Wisconsin!" It spread the idea of safety beyond the plant, the community, and the state. Parker's employee publication reproduced the billboard, added advice on safe vacation driving for Parker employees.

. . . *Bring the family in.* Good methods include children's poster contests and slogan contests for workers and families. Plus letters, booklets, and pamphlets mailed to home addresses. Then there's a "Family Driving Agreement" issued by Employers Mutuals of Wausau. It looks like a legal document, lists 17 rules that driving members of the family swear to observe. The family decides on penalties—for example, forfeit of driving privileges for a while.

. . . *Try a driving-skill contest.* You can stage one at a company outing if there's a fairly large open area. Set up wooden posts about 4 feet high, top them with red flags, let them represent automobiles and corners to be avoided. Judge contestants on speed of reaction, handling skill, braking, and distance judgment. A call for volunteers to keep score helps build up enthusiasm, put the contest over. Suitable prizes for winners are driving caps with recognition lettered across the front.

*Turn the page*

*. . . Schedule a family night.* It's a good time to promote safe driving. Bring safety into the entertainment. Include a talk by a member of the safety staff or a local safety expert. Show a safety film.

*. . . Hold panel discussions.* They'll help show how accidents affect people besides the victim. Include the plant physician, personnel manager, an employee. Ask each to state his view of an accident. And round out with a question-and-answer period with the audience.

## Start with your company drivers

You've probably got one or more workers—deliverymen or truck drivers—who spend part or all of their time driving for the plant. They are the ones to start with. Why? Look at the cruel facts about on-the-job drivers: In 1953—3000 killed, 100,000 injured. In 1954—a 7% increase in fatalities, 5% in injuries—over the previous year. In Wisconsin a 5-year study showed nearly 38% of occupational deaths were due to vehicle accidents. And in a recent year in New York State vehicle mishaps accounted for 20% of all occupational deaths; in Minnesota, 24%; in California, 29%.

To cut this toll, here's what you can do:

*. . . Pick your drivers.* You'll need four tools:

1. An application form that digs out the facts about the applicant's driving record.
2. A physical examination by a physician.
3. A good interview to gage applicant's personality.
4. A follow-up on references, checking with the applicant's past employer (FACTORY, May 1955, p. 95) and with any police and credit records available.

*. . . Give applicants a road test.* Try the one developed jointly by the American Automobile Association and the Institute of Public Safety at Pennsylvania State University, University Park, Pa. It's a model test and checklist. But remember—success of a road test depends on the tester's skill and on his powers of observation.

*. . . Train new drivers.* Formal training's best. But if it's impracticable, let a senior driver spend a few days with the newcomer.

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YOU BE THE ARBITRATOR

**THE CASE OF**

# The Job Outside the Bargaining Unit

Out of the experience of
The American Arbitration Association

**SAM T.,** punchpress operator with 6 years' seniority, was laid off June 10 with the rest of his department. A few days later the personnel manager offered him a week's work as helper in research and development, outside the bargaining unit.

"Your seniority won't be affected by the assignment," Sam was assured. "You'll be called back to your job when production starts up."

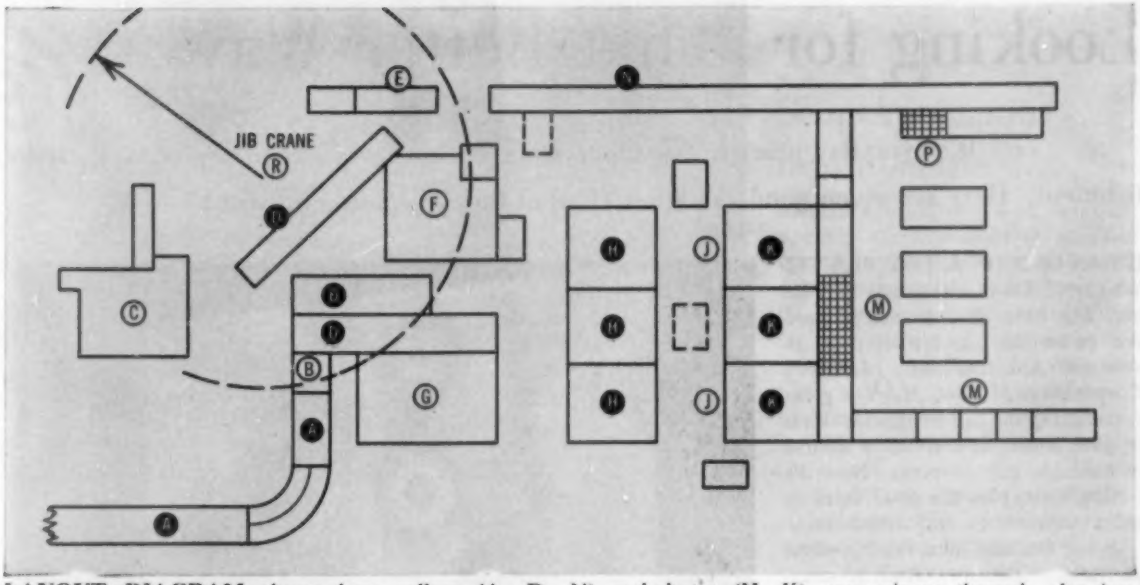
When Sam was recalled a month later, the union filed a grievance.

"Sam lost his seniority when he took a job in research," the steward argued. He cited a contract clause saying seniority would be forfeited by transfers out of the bargaining unit.

"That wasn't a transfer. It was a one-week assignment during layoff," the company replied. "Sam wouldn't have lost seniority by taking temporary work with another company. Why should it be different now?"

Eventually the case went to arbitration. *You* be the arbitrator. How would you decide?

*For the actual decision, turn to page 216*




**LAYOUT DIAGRAM** shows how rollers (A, D, N) and chutes (H, K) ease pieces through cleaning.

# Job Shop With Non-Stop Flow

**Clever layout of conveyors and chutes combines production-line flow with job-shop flexibility, speeds all kinds of castings through cleaning.**

**LOOK AT** the layout diagram. It illustrates an artful—and inexpensive—arrangement of roller conveyors and special chutes in a foundry's casting-cleaning department.

Where? At Allis-Chalmers Manufacturing Company, Norwood, Ohio. Why? To minimize non-productive handling of a variety of castings.

Chutes were designed by Plant Engineer Gerald E. Smart. They and the conveyors link equipment for cleaning non-ferrous castings of different metals and sizes. Seven workers shift from machine to machine as production demands change.

**How castings flow**—Gravity conveyor (A) takes them from shakeout to the knockout grate (B). Air hammer pushes out the cores. Then a 3-ft. move to the shot-blast table (C) —by hand for most, by jib crane (R) for heavy ones.

Gravity conveyors (D) take large castings to a cut-off wheel (E), aluminum castings to a band saw (F), bronze castings to another band saw (G). Wheel and saws remove gates and risers, trim flashings.

**SHOP-MADE CHUTE** speeds handling of non-ferrous foundry castings. Contents of chute show the wide variety of castings produced in short runs.

When saw operator finishes a casting he lifts it, makes a half turn, and drops it in chute (H—see photo also) to snag grinders (J). Snag grinding is done on two pedestal-mounted units and two abrasive belts. Castings that are too heavy for off-hand grinding are moved by roller (N) to a down-draft table (P). A second set of chutes (K) is mounted above snag grinders (lower right in photo). After snag grinding, castings are placed in these chutes. They slide down to down-draft tables (M) for final hand finishing by air-powered grinding wheels and rotary files.

# Looking for "That Better Way"?

**It's everyday practice for supervisors at this Long Island toy-making establishment. Here are seven good examples of what they're coming up with.**

**IDEAS OUT OF A TOY PLANT?** Why not? Dolls and games may be just for fun. But toymakers are just as serious about their costs as you are. And that's why Ideal Toy Corporation (Hollis, N. Y.) gives cost-cutting the full treatment. First it gave most supervisors a course in methods improvement. Now it's having them pass the good word to other supervisors and assistants.

Why? Because Ideal is a big wheel in the toy industry. And, to compete with smaller companies with lower overhead, it has to keep whittling production costs down.

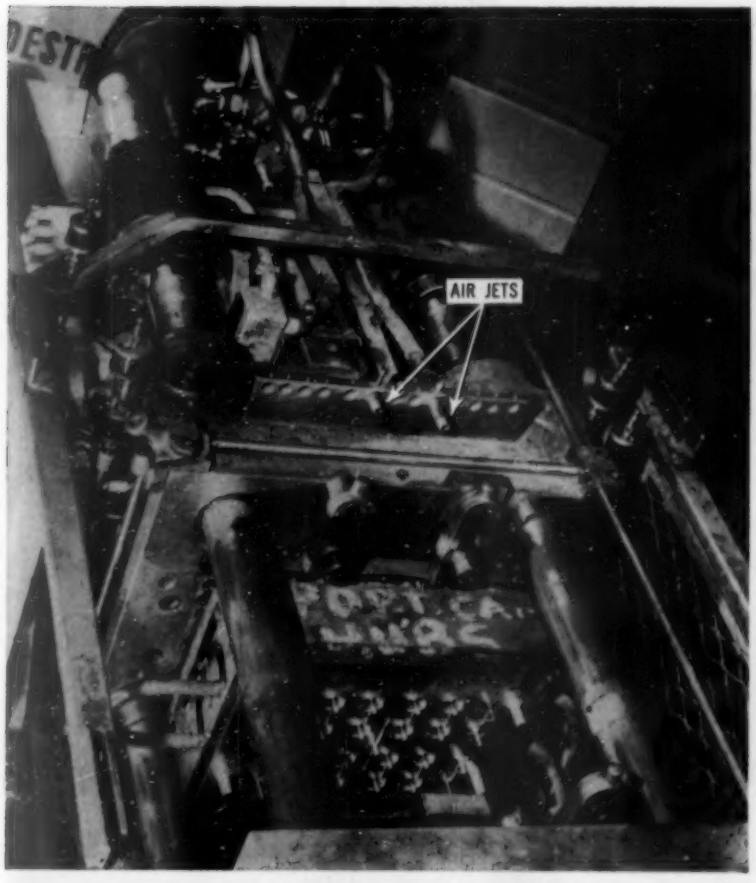
**Results?** They show up in better methods like the seven that appear on these pages and the next two. All seven are the kind that reach out beyond the toy industry in their application. We think some of them may hit you where you live.

## Instruction Boards Aid Inspection

It's a wide range of products at Ideal. And inspectors just can't remember everything to look for on any one toy. But a sample board, like the one up above, lists instructions and precautions for checking each item. As new problems come up, instructions are added to the board. For example: "NOTE—It's possible for this mystery tunnel to be screened upside down. **So check.**" Boards have been in use for a year and a half, have reduced rejects, especially in rush seasons.

## "Stick of Screws" Simplifies Assembly

Hex-head screws automatically snap off this 27-screw stick as they pull up against plastic parts being assembled with a small air driver. "Screwsticks" (American Screw Company, Willimantic, Conn.) make individual placement and driving unnecessary, permit both operations at once. They've halved fastening time for small plastic parts.




## Semi-Automatic to Automatic

Ideal converted this 4-oz. semi-automatic injection-molding machine into an automatic—and spent only $600 for materials and labor to do it. A semi-skilled operator can service two or three of these converted machines. Used to serve only one when molded parts were removed by hand.

With properly engineered molds, conversion requires only:

. . . *Air jets* (photo) and associated control valve to eject the molded "shot" automatically.

. . . *Low-pressure safety* control system for mold closure. It moves dies into closing position at only 200 psi. If mold is clear, the rest of closure can proceed at the usual 75 tons of pressure.

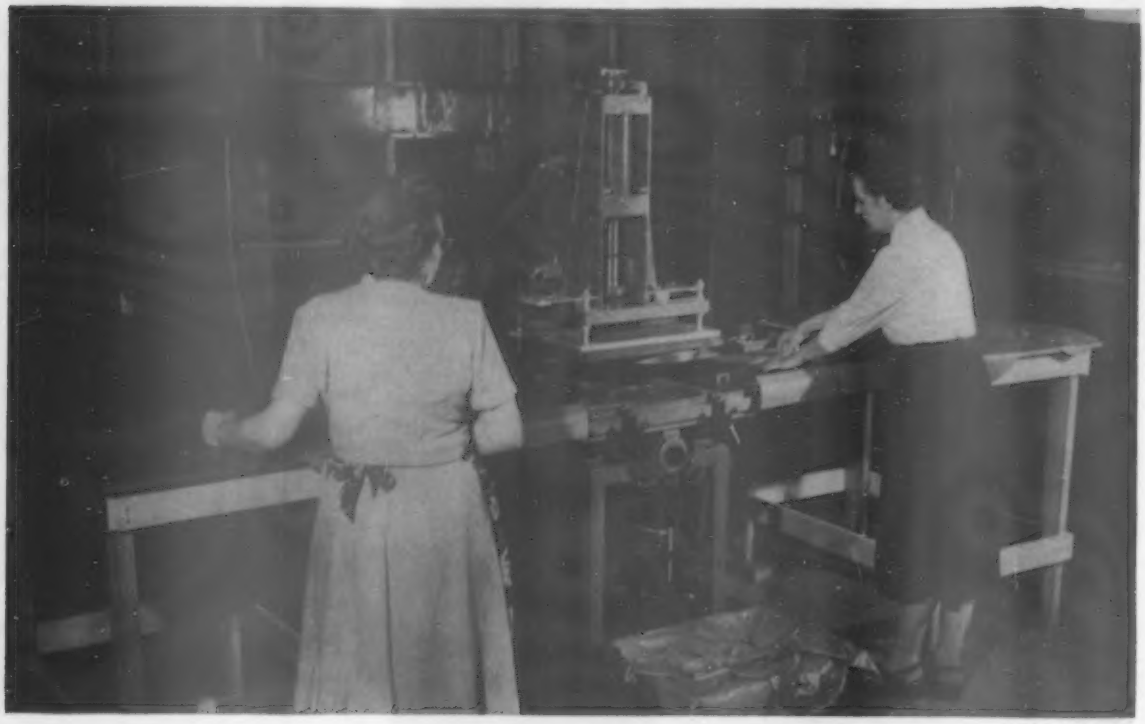
. . . *Warning buzzer,* and light, plus automatic shutoff to prevent jamming if shot is not ejected.

## Timers Meter Low Air Pressure

Timers that meter low air pressures through hypodermic needles have helped cut 50% off the time needed to inflate and seal small plastic toys. Ordinary back-pressure valves wouldn't work—because these balls require only about 3-psi. air pressure. Also, pressure must be controlled to just the right amount.

So 0-60-sec. timers are used to control solenoid valves that shut off air after a few seconds. (Normal line pressure runs about 80 psi.) Using needles to pierce and inflate these plastic toys eliminates the need for a special valve on the toys. Only a minimum amount of air can leak out between inflation and sealing of the tiny hole. And this can be allowed for by oversetting the timers slightly.

*Turn the page*



## Feed Tables Triple Machine Output

**Output has been tripled for these air-powered, multiple-station devices for feeding plastic parts to dielectric heat-sealing machines.**

Two girls using the sliding transfer tray (above) now seal over 400 toys per hour ( formerly 150, when one girl fed parts directly to the press). Three girls at the six-station turntable (below) now seal 1000 beachball sections per hour, against single-station output of 300.

In both instances parts to be sealed are rapidly indexed to the machine. That way, the machine doesn't wait while an operator assembles mating parts, removes sealed ones. All this work is done during the machine cycles. One girl usually starts the press cycle with a knee- or foot-switch. Rest of cycle is automatic, including timing the seal, opening the press, and indexing to next station.

Use of two-station tray or six-station turntable depends on size of parts and time required for the seal. For larger seals and slower machine cycles, there is often no advantage in going beyond two stations.

P.S. — Indexing tables are not new, of course. But their application to dielectric sealing poses new problems. Control of high-frequency radiation requires clever engineering. The simple addition of extra components (like indexing tables and controls) causes heat to disappear from sealing areas and show up in strange places. So that was the real achievement in making these improvements.

## If You're Stuck With Cementing...

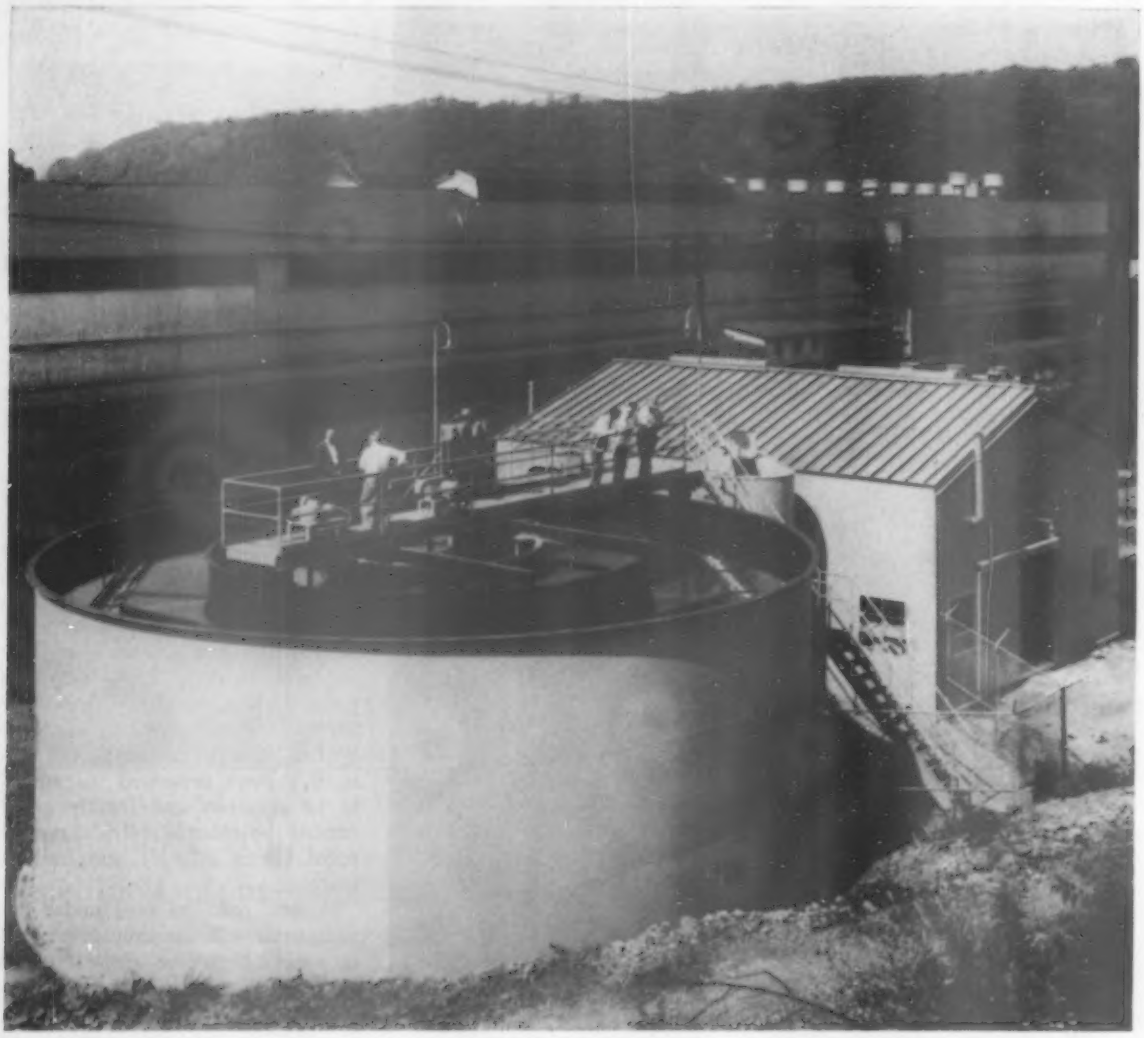
Cementing doll parts has come a long way—by Ideal's methods—since the days when a girl dunked doll parts in glue, put them together by hand, held them together with elastic bands until they were dry. Over the years the method at left was developed. It turns out about 10 times as much production with one-fifth of the labor.

This system uses an 8-station, air-actuated indexing machine for holding parts while glue sets. The glue applicator on the right is also controlled by an air cylinder. Operator presses right pedal to lift applicator out of glue. Applicators are designed to mate accurately to plastic parts—and to apply only the right amount of glue. Operator's left foot controls indexing machine. Pressing this pedal opens front cylinder, allows cemented assemblies to be removed and freshly glued ones to be inserted. Releasing the pedal closes cylinder and indexes machine.

A new machine now under development will use only one pedal to control both glue applicator and indexing machine.

## Operator Does Entire Production Job

It's usual practice for molding-machine operators to do productive work during the machine cycle. But Ideal wants operators to perform all operations associated with the final product. Take this plastic car kit, for example. Operator removes molded form from an 8-oz. automatic injection press. She then breaks parts out of form, degates them, assembles them into the package with instructions, and inspects her work. (Note the inspection board, upper right. It shows her what to watch for to maintain desired quality.) Then she packs small boxes into cartons, which go directly to shipping. The system eliminates all the usual handling between productive operations.



**BIG TANK,** shaped like a cylinder, takes in turbid, iron-filled water from a nearby creek, clarifies it, and turns out clean water for process cooling. Shed in background houses raw- and clear-water pumps, chemical feeders, and other auxiliary equipment.

# Cleaner Water—and More of It

**Your water supply dirty? Clogging up your pipes? Then read how Universal Cyclops gets clean water from a fouled-up stream. Might solve your problem, too.**

**COOLING-WATER** distribution lines clogged. Water supply throttled. New pipe to replace choked pipe.

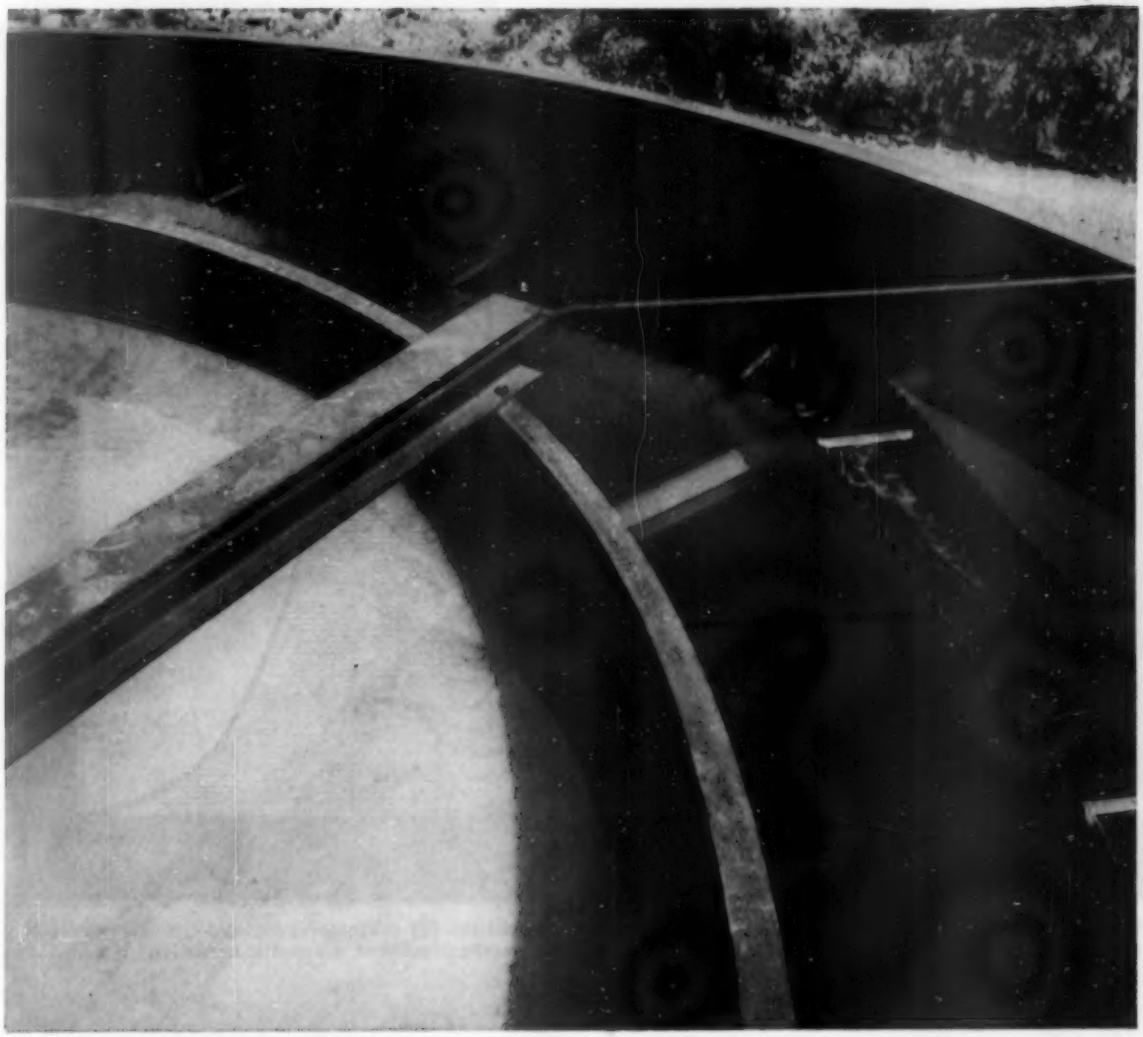
Happened time after time at Universal Cyclops Steel Corporation, Bridgeville, Pa. Meanwhile, cooling-water demands grew.

Real trouble-causer was the water source—Chartiers Creek, a small stream that carries farm-land run-off, mine drainage, some industrial waste and raw sewage. Highly turbid at times. Contains lots of iron in solution and iron bacteria.

Iron contaminants were the villains. Even a filtration plant didn't stop them.

**Old way**—Creek water passed through five 150-gpm. pressure sand filters. Then into a distribution system serving five electric furnaces, several rolling mills, other needs. Each furnace (using about 600 gpm.) discharged into a common collecting tank. Then two pumps (150 and 450 gpm.) returned water to the system downstream from the furnace supply. The plant used about 1,000,000 gallons per day—one-third of it from water recirculated from furnaces.

Filters were backwashed regular-



**CLOSE-UP LOOK** at the big clarification tank shows how the heavy floc forms and settles in the middle zone. Clear water, free of iron and bacteria, forms in the outer zone and flows over V-notch weirs into collecting trough—ready for use in the plant.

ly with clear water—purchased at considerable cost. Costs mounted as cooling-water demands grew. Worse yet, filters couldn't meet the pace.

So engineers from Dravo Corporation, Pittsburgh, surveyed the situation. *Conclusion:* (1) Buy no more outside water; (2) install a new water treatment plant.

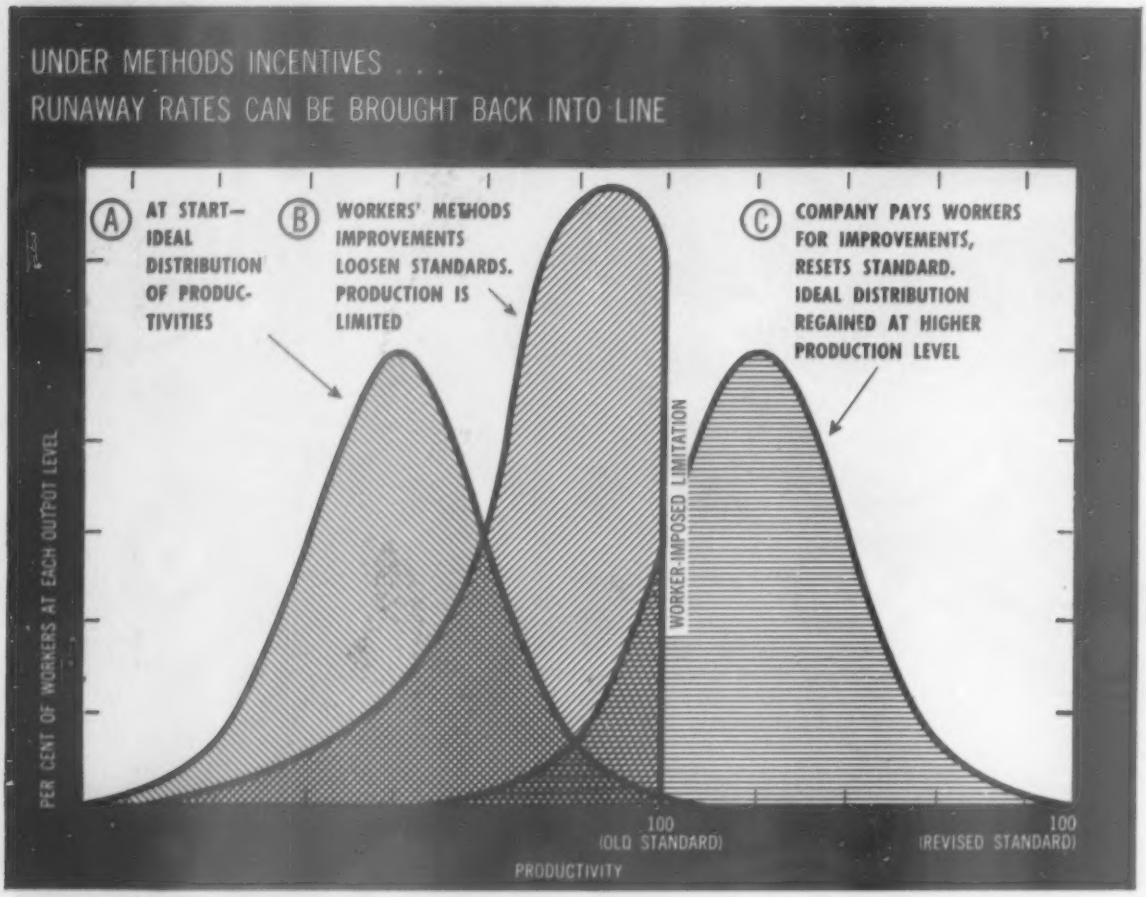
**New way**—Plenty of clear, bacteria-free water from the same creek. And capacity for future needs.

The new water treatment plant turned the trick. It consists of a Walker-Process Clariflow unit (Walker Process Equipment, Inc., Aurora, Ill.), plus necessary pumps, chemical feeders, a large clear-water reservoir, a building to house auxiliary equipment and flow meters.

Creek water enters the pump chamber through screens, which block floating debris. Three De Laval centrifugal pumps—each 750-gal. capacity at 40-ft. dynamic head—deliver water into the Clariflow unit. It's a cylindrical open-top tank divided into three concentric zones.

Turbid creek water enters a central chamber. There a motor-driven mixer blends certain chemicals—alum and lime — and some recirculated sludge with the water. Chemicals have already been injected by three chemical feeders (one is a standby) into the line from pumps to tank. Alum is the coagulant. Lime raises pH, reduces iron content. Line feed is adjusted to keep pH high enough to do the job—yet not coat the inside of the piping. A chlorine feed controls bacteria growths.

In the Clariflow, water flows from inner to outer compartments, where flocculation, stilling, and settling occur. Sludge settles, is collected by scrapers into a hopper. An automatic valve removes it periodically. Treated water flows off the top through V-notch weirs into a collecting trough and a balancing tank. Then three De Laval centrifugal pumps (740 gpm. each) deliver it to a new 700,000-gal. reservoir on a nearby hill. In winter, resistance heating cables at water level along the settling-zone edge keep ice from forming.


UNDER METHODS INCENTIVES . . .
RUNAWAY RATES CAN BE BROUGHT BACK INTO LINE
A AT START— IDEAL DISTRIBUTION OF PRODUCTIVITIES
B WORKERS' METHODS IMPROVEMENTS LOOSEN STANDARDS. PRODUCTION IS LIMITED
C COMPANY PAYS WORKERS FOR IMPROVEMENTS, RESETS STANDARD. IDEAL DISTRIBUTION REGAINED AT HIGHER PRODUCTION LEVEL
WORKER-IMPOSED LIMITATION
PER CENT OF WORKERS AT EACH OUTPUT LEVEL
100 (OLD STANDARD)
100 (REVISED STANDARD)
PRODUCTIVITY

**WITH METHODS INCENTIVES,** standards are first set so only top operators make standard **(A).** Workers learn to beat standard **(B).** But in return for paying for workers' new methods, company can reset standard at higher level **(C).**

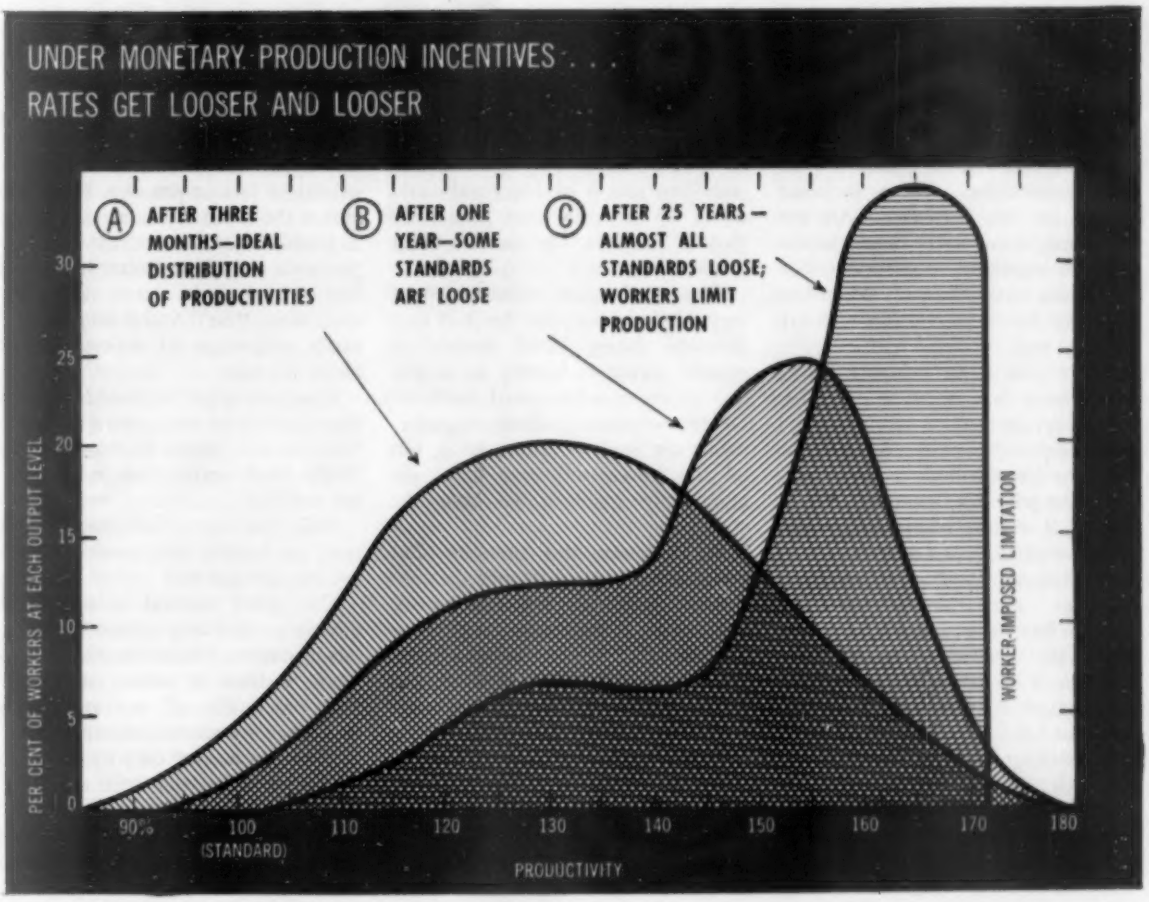
# New Look at Methods Incentives

**Want to bring runaway rates back into line fast, under a system that lets both management and worker profit? And never worry again about worker-imposed limits on production? You can, says Author Taylor, by substituting methods incentives (charted above) for production incentives (opposite page). Here's his intriguing case.**

**INCENTIVES TOO LOOSE?** Threatening to run away? Do you suspect your workers are limiting production output? That happens in many plants. And when it does, some authorities say the solution is to tighten supervision. I disagree. I think those troubles are to be *expected* of a monetary production incentive. Because such an incentive puts worker and management at cross purposes. You can't expect a worker to suggest a methods improvement if it's going to mean a re-study of rates—less money, or at least more work for the same money.

A better solution, in my view, is methods incentives. Under such a system, workers are on measured daywork. They get no premium pay for meeting standards. Therefore they have no reason for keeping methods improvements to themselves. Add to this system an honest, high-reward suggestion system, and you'll get methods improvements galore. There'll never be a top limit on production. Both worker *and* management will profit.

By W. W. TAYLOR
Uhling, Taylor and Associates
Cincinnati




**WITH PRODUCTION INCENTIVES,** curve **(A)** shows normal starting-point. A year later **(B),** some standards are still good, though many are loose. Years later **(C),** workers can easily beat most standards, are limiting production at 173%.

## What's wrong with production incentives?

Take a look at the chart above. It shows the case history of an actual monetary production incentive. Three months after the installation of a plan designed to provide 133% average earnings, things are right in line. Actual average earnings are 131.5%; worker productivities are ideally arranged in a normal distribution on both sides of average, and almost all are above the line of base pay, or 100% productivity.

In this case, as in most, such an ideal state did not prevail for long. After 1 year, many of the standards have become inflated and are responsible for the node at 155% productivity. Some standards have retained their value, and are responsible for the strong but miniature family likeness of this curve to the original, at levels below 130%. (Study of areas under the "3-month" and "1-year" curves indicates that only 55% of the original standards are still in line. Average percentage rate by which all standards have inflated: 7.6% per year.)

The third curve shows what happens over the long run. It gives the distribution of productivities in another department of the same company. The incentive had been in effect for 25 years. The unnatural vertical drop at the right side of the curve spells out one thing in no uncertain terms. The great bulk of the standards are now so loose that the operators dare not turn out full production for fear of "killing the goose that laid the golden egg." Instead of being a spur to productivity, the "incentive" is now acting as a brake.

The vertical drop indicates that among the operators 172% is the agreed point of maximum earnings —the worker-imposed limit on production. It also shows, beyond any doubt, that still greater productivities are easily possible. What has happened is that the operators have found better methods of performing their tasks than were being used when the standards were set. So long as the operator's productivity is less than the agreed top limit, it's in his interests to develop better methods. As soon as he reaches the agreed top limit, there's no further incentive for him to develop better methods.

You may look at curves *B* and *C* and say, "More production is coming out than under Curve *A*." That's right. But this viewpoint ignores the fact that if the inflated standards were deflated there would be *more* output. And, still more important, this output would be produced at a lower labor cost.

*Turn the page*

**Why incentives go wrong**—Industrial engineers often put the blame for decay of incentives on poor supervision. There is some foundation for this view. All too frequently supervisors forget to notify the standards department that conditions have changed. When this happens, the chain reaction of decay is on its way.

More and more evidence, however, shows that incentive standards also decay in a more subtle—and a more important—way. What if the operator himself finds a better way to do the job? For example:

. . . *A milling machine operator is face-milling a cast-iron part with a high-speed tool.* His incentive earnings are "normal." Three months later a second job is started across the aisle from him. This job, because of its long-run nature, calls for a tungsten-carbide mill. Our first operator helps himself to a duplicate, faster-cutting face-mill from across the aisle. Then sets himself up in ease and luxury on his own job. How long before this is discovered? It probably won't be.

. . . *Now take the case of a change in manual method not involving equipment.* Suppose an operator in a ceramics plant is given the job of chinking the cracks between refractory slabs with fireclay. At the time he's put on incentives, he uses the trowel method usually associated with pointing up brick walls. A departmental check of productivity distributions 3 months later shows a curve similar to curve *A*. Apparently all is well. A year later, a routine check produces a curve similar to *B*. What's happened? This operator added a little more water to his fireclay, giving it the consistency of toothpaste. He'd dig a ball of clay from his pail, grasp the ball in his fist, and extrude the clay from under his thumb, which he used like a trowel. This way he could complete several feet of chink with one sweep of his hand—and do in 45 seconds what previously took 5 minutes. He increased his productivity 566%.

Time and again re-inventory of methods indicates that the drift to a *B* curve during 12-15 months of normal incentive history is largely due to operator-improved methods. Of course some methods improvements are made by supervision, but all too infrequently are they systematically incorporated into the standards.

**Don't blame the operator**—Put yourself in his place. Under the conditions found in most incentive shops today, would you reveal to supervision that you had found a better way of doing the job? Or would you keep quiet and report only as much production as you dared? That's why incentives that pay a premium for production will, sooner or later, through unofficial methods improvement, bring about operator restriction of output. This defeats the very purpose of the incentive. Even more unfortunate is the psychological barrier that by this time has developed between worker and management. The former now sees little in common between his own interests and those of the company. Why should he? Even if he does reveal the improved methods (that nobody is in better position to see than himself), it will merely result in his having to do more work for the same pay. And if there is a suggestion system in operation he has a tough decision to make. Will the chance of reward for a suggestion compensate him for the lower earnings at a higher rate of output that would result from lower standards? You know the answer to that.

## Methods—not speed—limit productivity

Two main factors affect manually controlled output: manual motions made, and speed of motion. Increased speed alone brings only puny and non-repetitive increases in productivity. But the limit on increased productivity obtainable by altering the length, type, or sequence of motions used to perform any task is almost infinite.

Want proof? Then try this experiment: With an assistant timing you for one minute, write your signature, or any selected word, as many times as you find natural in your normal hand and at your normal pace. Now repeat the experiment, this time writing as fast as you can. Keep the letters the same size and, as nearly as possible, the same shape and appearance as before. Count the number of times you wrote the word each time. You'll find a surprisingly small percentage of difference between the two.

Compare your increased writing capacity due to extra *speed* with the operator who upped his productivity 566% by a simple change in manual *method*.

OK, you say, production incentives are loaded with trouble. What are the alternatives?

One good method is measured daywork—tied to a system of methods incentives. Under measured daywork, instead of issuing standards that practically all operators can beat, they are set considerably tighter, and can be met only by the best operators using the best available methods. (This is often called "high-task" measured daywork.) A distribution of productivities as shown on curve *A* in the chart on page 90 should then result. Note that production is not substantially less than curve *A* under a monetary plan (page 91). The difference is that standards are tighter, giving a lower productive index for the same production output.

Under measured daywork, no premium is paid for productivity. The factors maintaining productivity at the indicated levels are:

. . . *Personal pride* of the operator, who doesn't like to be beaten by his mates.

. . . *Efforts of supervision* to enhance this spirit, by seeing that working conditions and employee morale are good, by eliminating causes of delay, and by publishing productivities daily.

Now, since it is only human nature to try to find an easier way of accomplishing any task, it won't be long before better methods will be used. At this time a skewed distribution curve will appear, as shown by curve *B*, page 90. As bad off as you were before? Not if you back up measured daywork with methods incentives.

## Why methods incentives work

What industry needs is a form of incentive that will give *continuous* improvement in productivity. As demonstrated above, it's only logical to seek this through better manual methods as opposed to the strictly limited potential obtainable through greater speed.

This involves specifying manual methods, present and suggested, in some way that will give a time comparison between the two. Motion-time standards allied to predetermined-time formula techniques will give you exactly this.

Given a specification and a measurement of method, you still need an incentive to induce an operator, working on today's method, to suggest the better method which, we can be sure, will occur to him. Suggestion systems are designed to do just this, *provided they do not have to compete with premium paid for output.*

This is where methods incentives come into play. Because it is precisely at this point that you can bring the operator and the company together in what is a bargain to both.

Why not buy from the operator his own method improvement in return for a lower standard? The operator gets a profitable suggestion award (say half the first year's estimated savings) and the company gets lower labor costs.

An improved method would reduce the standard time and would bring the distribution of productivities back, temporarily, to the ideal, *but at a higher production level* (curve C, page 90). Before long the cycle repeats. Better methods still are developed and standards are once more reduced, in exchange for suggestion awards.

Here then are the ingredients of a methods incentive based on measured work standards:

. . . *Specification of accepted method* by motion-time formula techniques, giving standard time for each operation.

. . . *Measured-daywork application* of standard operation times, without premium for output.

. . . *Awards for suggestions* leading to improved methods.

**Can be sold to labor**—Employees will "buy" methods incentives because they satisfy fundamental job requirements:

. . . *Security*. The worker's standard of earnings is not threatened when new methods are installed, as they are under effort incentives. Instead, earnings are actually increased by the award, can be counted as a clear gain for the employee's sense of security.

. . . *Recognition and opportunity*. Awards for suggestions, leading to improved methods, give direct recognition to the employee. They also provide opportunities in his daily work to demonstrate ingenuity as well as proficiency—so important in getting ahead.

. . . *Inclusion*. Contribution to the common goal heightens his sense of participation in the work of operating the business successfully.

## How to install a methods incentive plan

The installation of a methods incentive cannot be undertaken lightly. All levels of the organization from the president down to the operator must be familiar with the objective: "To increase productivity through better methods, rather than through greater speed."

Direction of the work should be delegated to a project manager working for the company, and should be backed up by outside counsel if adequate technical experience for such a program is unavailable within the organization.

Properly handled, there should be no difficulty in "selling" a methods incentive to labor. Its features are in line with the demands of labor, whether unionized or not. Acceptance cannot be expected, however, until persistent and patient efforts have been taken to demonstrate, by example, the way the system works, and how successfully it will work. From the start, every effort should be made to lay the cards on the table and to clear up whatever doubts may arise at any level.

Having laid the proper groundwork for a successful application, and established an organization for proper administration, here are the principles to be observed:

. . . *Prepare a methods-time formula for each process currently used in the plant*—after making what method changes are immediately practical and economic. These formulas, beside describing in detail the manner in which each element of the process is to be performed, provide equations from which, either directly or by means of intermediate tables, a time standard may be calculated for any operation using the process,

. . . *Determine the range of deviation of productivity to be expected from a group of operators working on the process*. Modify the time formula so that time standards, set from it, can be met only by the best operators working under favorable conditions.

. . . *Set operation times from the modified time-formula*. Apply these to daily production. After making allowances for delays beyond the control of the operator, develop daily scores—standard time for the work done versus time actually taken to produce the work—for each operator and each department. (Example: 7 standard hours produced in an 8-hour day give a score of 87½% efficiency.)

. . . *See that each operator is advised daily of his productivity*. Be sure he understands the methods on which the standards are based. See that reasons for delay are eliminated. In every way (short of paying premium for it) you should encourage high productivity

. . . *Install a plan with awards for suggesting better methods*. Pay handsomely for accepted methods or suggestions. Don't begrudge half the first year's savings. Remember you'll get all the subsequent savings.

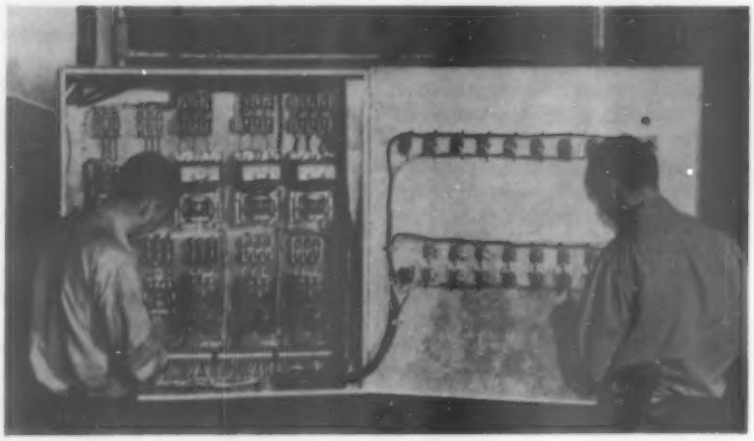
. . . *Plot the distribution of productivities in each department at frequent intervals* (as in charts at top of previous pages). If "skewness" indicates that productivity is being artificially limited, notify each operator that, on a stated date, the methods on which the present standards were based will be reviewed. To merit an award he must submit suggestions for improved methods before that date. When methods have been revised and lower standards issued, the moratorium on method suggestions should be lifted.

# Eight Smart Electrical Ideas

**So smart we know your electrical people will want to snap 'em up. They're ready to go to work in your plant right now. And guaranteed to whittle down costs.**

**THE EIGHT IDEAS** in these three pages came from one of the smartest electrical maintenance departments anywhere—our good friends at Cleveland Twist Drill. If you want to learn how CTD stimulates ideas like these, see May FACTORY, p. 102. We called that article "Pattern for Your 195X Electrical Force."

Which explains why we speed these eight bright ideas to you. Not all are earth-shakers. Some won't hit you at all. But we'll bet a couple will. Maybe four or five. Hadn't you better take a look?



## 1. Do It Yourself

At CTD that means install electric equipment—and build a lot of it, too. These men are installing a simple coolant-system control panel designed and built by the company's electrical department. It's one of many installation jobs—including machine tools and automatic process controls—that are handled by electricians at CTD.

Sure, it costs more to figure out blueprints and boss the installation yourself. But, says CTD, you'll save money, long-run. Here's why:

. . . *You'll familiarize* your men with the equipment, thus make maintenance easier for them.

. . . *You'll spot*—and eliminate—quirks that could lead to future maintenance problems.

. . . *You'll find ways* to improve equipment by modifying controls—especially in complex equipment. Maybe the maker made a mistake. Maybe your requirements have changed. Anyway, you get a chance to second-guess the manufacturer.

On one grinder, CTD devised a braking method to cope with faster-than-expected cycles. The maker had said it couldn't be done—but later he got permission to incorporate the idea into subsequent models of the machine.

## 2. Automatic Boss for Capacitors

That's the boss you see here—the control cabinet, that is, not the man. Puts capacitors to work when they're needed, lets them relax when they're not needed.

What led to its use? New machine tools, with multi-motor drives, were dropping the plant's power factor from a respectable 95% to a piddling 75%. So CTD added capacitors to secondary distribution lines. Worked fine. But when a lot of machine tools were shut down at the same time, voltage on the lines shot up—caused lights, motors, electronic equipment to burn out.

What to do? Disconnect capacitors by hand switching? O. K. But that takes time. So CTD went for automatic control. Works like this: When the load on a line goes up, an element on the control panel senses the voltage drop, signals a group of pilot relays that add capacitors to the line. When load decreases, sensing element signals relays to take capacitors off the line.

A red and a green light serve each group of capacitors. Each group consists of three banks (45 kva. per bank). When the red light is on, the group of capacitors is working—green, idle. A look at the control panel gives a pretty good idea of how much of the plant is in operation.

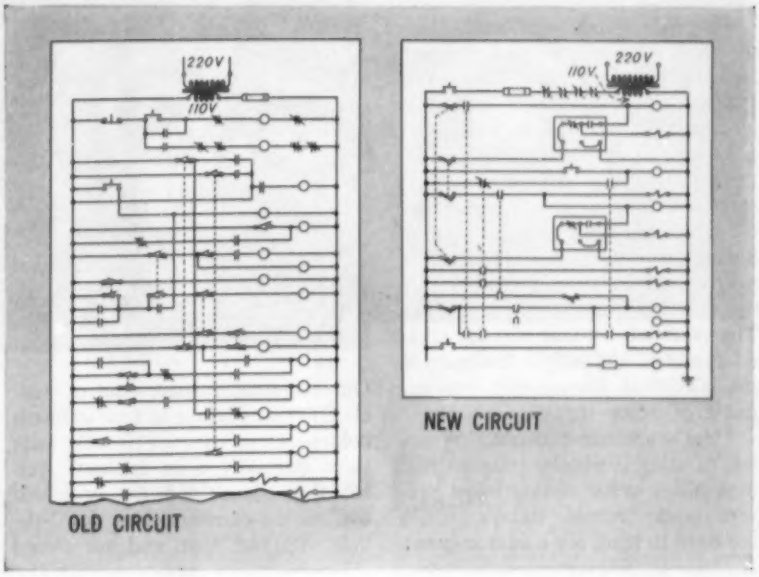
Capacitor groups can also be switched manually, as the man in the photo is doing with the group represented by the lights at far right. He can operate manual controls after first turning a knob (above the lights) that switches from automatic to manual control.

## 3. Ban High-Maintenance Parts

Maybe something else will do. For instance: CTD substituted ignitron tubes (two are at right in photo) for mechanical contactors in a circuit that was opened and closed as much as 20 times a minute.

Mechanical contactors in this circuit on a heat-control panel wore out fast—needed points every month, replacement every six months. Tubes last indefinitely—no moving parts are involved in power interruption. Cost of ignitrons? About 20% more than mechanical contactors they replaced.

## 4. Simplify Those Circuits




See these single-line diagrams? They show the automatic control circuit for a grinder before and after CTD's electricians simplified it.

The old circuit had 11 limit switches, 16 relays. New one has three limit switches, seven relays.

Why simplify? To reduce breakdowns, make maintenance easier. From this change CTD got a dividend—the machine now grinds twice as many drills a minute. Reason: No delays caused by limit switches.

CTD does a lot of this on control panels for automatic machine tools —sometimes goes to unconventional circuit design. Does most of it when machines are first installed.

## 5. Why Grease Your Motors?

To keep them running, of course. But maybe they'll run better, longer if you skip periodic greasing. That's CTD's practice with about 50% of the motors in its plant.

How come? Because maintenance men and machine operators—who slapped in grease every time a motor didn't sound right—were over-greasing. Grease, forced back into rotors, clogged them, stifled ventilation, caused daily motor burnouts. Also, dirt got into motors because fittings weren't cleaned before greasing.

So now CTD follows this procedure with many new and used motors that come in for overhaul:

Check seals for tightness, grease housing for cleanliness. Put in quality grease, seal grease housing. Cut off grease fitting (see photo), plug it. File down plug so it can't be removed (this foils the grease-conscious operator). Paint yellow spot and date on housing.

What size motors? Any size from ½- to 60 hp. But mostly in the 10-hp.-and-below class. Some old-style motors still need periodic lubrication. For instance: Sleeves on sleeve-bearing motors must be oiled regularly.

Results? Costs halved for repairing burnouts, replacing bearings, revarnishing, insulating, greasing.

*Turn the page*

## 6. Use Plug-in Components

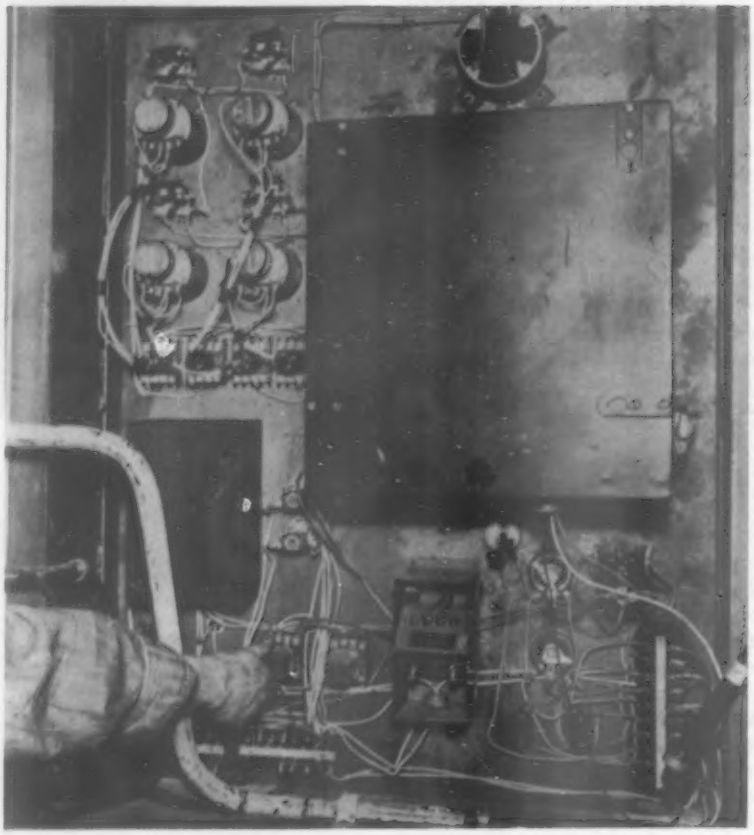
You'll find them valuable on production processes where you can't afford downtime. That's because you can replace a plug-in component in 5% of the time it takes to replace a conventional component.

The electronic panel shown here is an example. It controls a salt-bath furnace. If the furnace is down for more than an hour it freezes up, is out of production for at least a shift. That rarely happens where electrical maintenance is concerned, because plug-ins can be removed and installed in minutes.

Plug-ins shown here are a pair of relays (lower left) one of which is being removed—and four timers (upper left). CTD also uses plug-in capacitors, amplifiers, and other electrical equipment.

Of course plug-ins cost more than standard components. But they pay off in reduced labor costs for maintenance. For instance: Hooking a plug-in amplifier to a temperature recorder is a five-minute job at CTD. The same job without plug-ins takes 45 minutes, and only a few men in the electrical department are capable of doing it.

Here's another thought: Where you're using dissimilar plug-ins that look alike, color coding helps prevent costly errors. Relays, which are hard to read, are a case in point.



On heat-treat furnace-control panels CTD uses relays of four different colors—green for 110-volt with three normally open contacts; yellow for 110-volt with two open and two closed contacts; blue for 110-volt with two open and one closed contact; and red for 110-volt with two open and two closed contacts.

Why these precautions? Plug in the wrong relay, and you'll blow the relay (costs between $7 and $10). Or if the relay doesn't blow right away, you could start a fire.

## 7. All Those Controls Necessary?

CTD's electrical department asks that question whenever production orders new equipment. (Orders for such things as machine tools are checked by plant engineering.)

Why the question? Plant Engineer Clarence Petzinger puts it this way: When production men order a machine tool, they tend to ask for the moon—want it to be as automatic and versatile as possible. But their choice may mean maintenance headaches and lengthy downtime. Maybe a simpler machine would fill the bill—and cost less to buy and maintain.

For instance: Production asked for a custom-built lathe with electronic controls and infinite speed range up to 1500 rpm. But the job—a simple turning operation—could have been done as well on a machine with a 12-speed gearbox.

Approach your buying problem this way, Petzinger suggests: First try mechanical controls. They cost least to buy and maintain. If they won't do, consider pneumatic, then hydraulic, electrical, or electronic.

You can put a simple variable-speed drive on a machine for around $500. An electronic drive for the same machine would boost cost to about $1500. Sure, electronic drive is more versatile. But maybe you don't need that much versatility.

## 8. Standardize on Equipment

You'll reduce maintenance costs and production downtime, simplify training of electricians, and cut back your inventory of spares.

What to standardize? Well, motors, for example—and starters, relays, solenoids, timers, limit switches, etc.

Pick a company that makes a product best suited to all your needs. Then buy all your motors, say, or all your solenoids from that company. Don't worry about not spreading your business around. You'll probably end up buying only one kind of product from each company.

**NOON IN PITTSBURGH** 10 years ago. But not today—and never again. Pittsburghers have cleaned up.

# Now It's Clean Air—or Else

**Communities all over are clamping down on air polluters. So, if your plant is a spewer or a smoker, better start being a good neighbor. Right now.**

**SMAZE, SMUDGE, SMOG,** smoke, smist, smell. Call it anything you like. It's still air pollution. It's fast becoming a major national problem. It's making people madder by the minute. And most of them blame industry.

Truth is, industry isn't entirely to blame. Sometimes, not at all. But the public is aroused. So—industry had better get busy.

How? It can do two things:

. . . *Put its own house in order.*

. . . *Educate the community.* Especially about sources industry can't control—badly fired furnaces, garbage dumps, waste burners, autos.

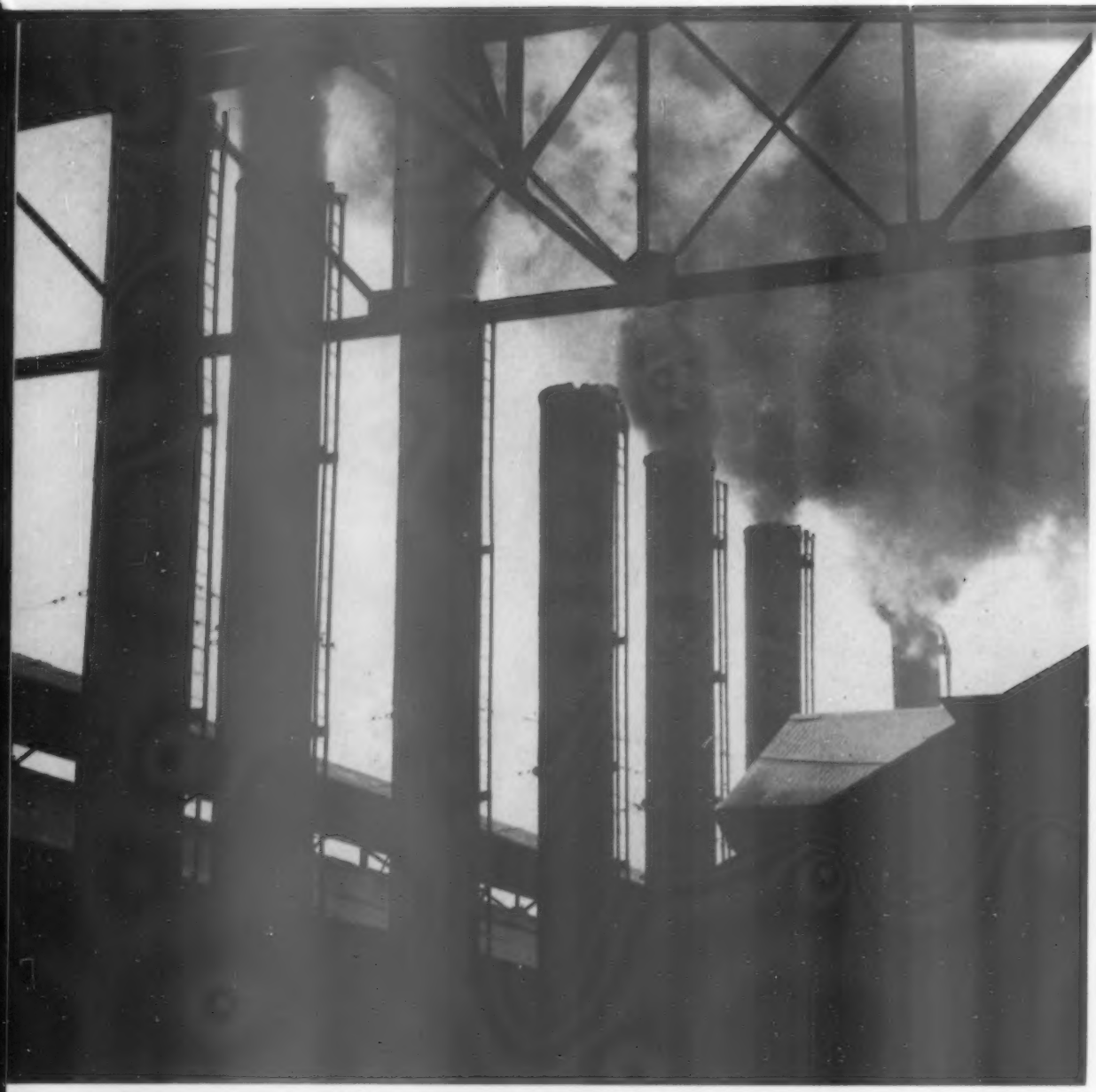
"But," you say, "why me? My plant isn't to blame." Don't be too sure. Air pollution is rarely a one-plant offense. Better get the facts. Then, if you're even slightly guilty, do something about it.

Can't afford the equipment, you say? Study may show you don't need any. Maybe, if installed, it would salvage valuable dust or fumes, thus pay its way. Even if it did come high, doing nothing would cost you more eventually.

Suppose you're in the clear. Even then, foul air is your loss, wherever it comes from. It annoys workers, threatens health. Attacks the paint on your plant, spots or spoils your product. Damages flowers, trees, gardens. That's why, even if innocent, you'd better take steps—and take them now.

In the next seven pages Dr. L. L. Falk, air pollution expert, lays bare the whole problem and tells all you need to know. And what you can do. Better move fast. Because if industry doesn't police itself—right now—politicians and aroused citizens will take over.

*Turn the page*



**THESE SEVEN STACKS** and 31 others used to belch smoke all day every day at Universal Atlas Cement Company, near Pittsburgh. Now all 38 have been replaced by two big stacks, equipped with dust collectors and electrostatic precipitators.

# Air Pollution — a Big Problem Today

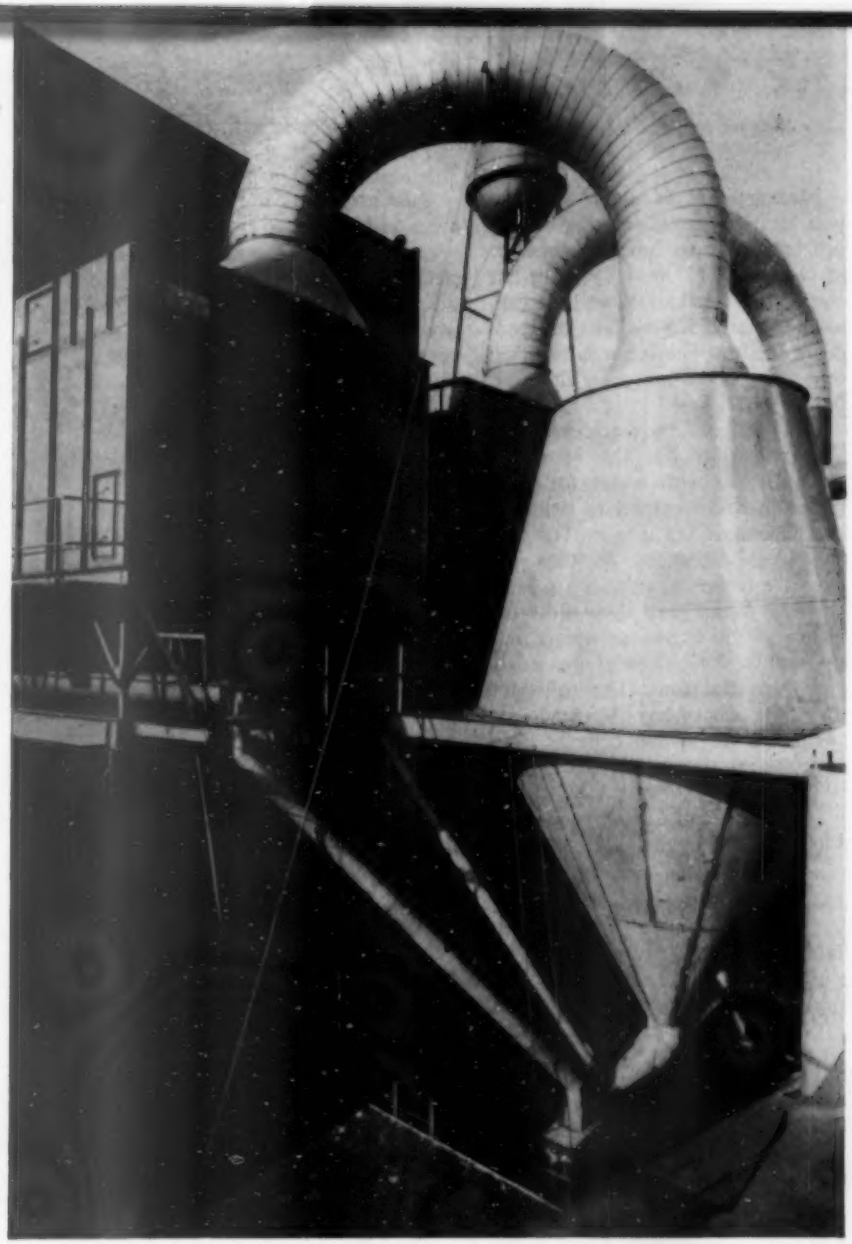
**AIR POLLUTION** is the excessive use of the air in your neighborhood, town, or city for getting rid of dust, dirt, and gases from human activity. This definition needs elaboration:

**"Use of air"** — There's nothing wrong in this concept. Human beings and animals exhaust breath into the atmosphere. Plant life exhales carbon dioxide. Natural resources can and should be used for waste disposal. This reliance on natural diffusion is a basic concept that has already been applied to waste disposal in streams. Air can and should be used for waste disposal to the extent that disposal does not interfere with human activity.

**"Human activity"** — This covers all sources of air pollution by man —from the smoking industrial powerhouse stack to the open city-garbage dump or the individual who pollutes the air with exhaust from his car.

Air pollution is usually the result of a combination of factors. On a clear, windy day wastes are dispersed faster than you can put them

By L. L. FALK, Engineering Service Division, Engineering Department, E. I. du Pont de Nemours & Company.



**NO MORE DUST** to annoy neighbors of Amalgamated Leather Company, Wilmington. Centrifugal collectors and bins trap dust that's buffed off 25,000 goatskins daily.

out. But on a calm, damp day everything seems to hang around. Dust settles and odors are more detectable. (Also your nose works better in damp weather.) I am sure you have noticed how the smell of honeysuckle—or the garbage dump—is more noticeable in the evening after the wind dies down.

Primarily there are three chief effects of air pollution:

. . . *Just a plain nuisance.* This is the most common complaint. I am sure the odors of the garbage dump will hurt no one. But who wants them? Years ago a smoking chimney was a sign of prosperity; now it means dirt for the housewife to clean up every day.

. . . *Property damage.* Dirty, smelly areas have lower property values. Homes or plants made dirty by soot need more painting. Dirty cars need more washing.

. . . *Damage to health.* Certain types of air pollution can affect the health not only of man, but also of plants and animals. For example, ethylene and hydrogen fluoride gas (at low concentrations) harm certain types of vegetation. Hydrogen fluoride, produced by certain chemical and metallurgical industries, also causes serious bone diseases in cattle when it is absorbed from the air or through the grass they eat. At concentrations that man cannot even smell, sulfur dioxide (one of the products from burning coal or oil) damages certain evergreens and fruit trees. Also, scientists have shown that some of the substances that cause eye irritation in the Los Angeles smog are similar to those that damage truck crops in that area, if not the same.

When air pollution has killed people, some unusual weather circumstances have been present:

. . . *In Donora, Pa., in 1948* the deaths were the result of fumes, gases, and smoke trapped in a valley for a number of days. This was caused by an unusual type of weather situation and cloud formation known as a temperature inversion.

. . . *In the Meuse Valley in 1920* the same thing happened.

. . . *In London in 1952* a severe fog trapped pollutants for several days. Deaths for that period were 4000 more than would have been expected in normal weather.

## MEASURING POLLUTION

It's a tough job. For one thing, the materials in the air that cause air pollution are present in very small amounts. Gases, even during severe air pollution, usually occur in concentrations less than 1 part per million (p.p.m.) by volume. One p.p.m. is the same as 0.0001% by volume. Some substances, such as mercaptans (from certain chemical, refinery, or wood pulping operations), can be noticed at very low concentrations (less than 0.01 p.p.m.). If one gallon of mercaptans were diluted in the air of a room the area of a football field and three stories high, we could still detect their disagreeable odors.

Another problem in measuring air pollution is that we sometimes don't know what to measure. For example, eye irritation is a characteristic of smogs in Los Angeles and the New York City area. Much time and money have been spent in trying to find the cause.

*You can now see the problem:* How can we measure the amount of eye-irritating material in the air if we don't know what causes the eye irritation and therefore what to analyze for?



*Turn the page*

Sometimes the effects of air pollution are caused by substances formed in the atmosphere from otherwise harmless elements.

For example, a chemical plant was discharging two materials from separate stacks. The amounts of each were far below those needed to cause trouble. But when the wind blew from the right direction to bring the two together, a reaction took place and a strong eye-irritating substance was formed—and an air pollution problem created.

Another example occurs in air pollution situations in many cities of this country. Sunlight causes chemical reactions, and eye irritants are formed from substances that would otherwise have no effect at all.

Proper sampling of the atmosphere is another problem in measuring air pollution. Changes in wind direction, night-and-day variations of wind gustiness, and rain or fog are all factors that affect sampling. Thus development of reliable sampling equipment is hampered both by the small concentrations that must be measured as well as by the large variations that take place from one moment to the next. However, great strides have been made in measurement of air pollutants—obnoxious and toxic gases, and dusts—despite these handicaps.

**Measurement of gases** — Certain gases can be absorbed in liquids and measured chemically. Ammonia gas (from chemical operations) can be absorbed in acid solutions and analyzed.

Methods have been contrived for measuring low concentrations of hydrogen chloride, sulfur dioxide, hydrogen sulfide, carbon monoxide, chlorine, nitric acid, and other possible chemical contaminants. (One or another of these has been found in the atmospheres over many of our industrial cities.) For example:

. . . *The Thomas Autometer* not only measures sulfur dioxide in the air as low as 0.05 p.p.m., but also makes a continuous record of the concentration.

. . . *A trap immersed* in liquid nitrogen, with air passing through, freezes or condenses pollutants for subsequent analysis by chemical or other means.

**Measurement of dusts** — What you measure depends on what the problem is. Dusts can be a nuisance in two ways: (1) that which settles out of the air (known as dust fall) and (2) that which remains suspended in the air. The latter is the dust that reduces visibility or clogs air filters.

Dust fall can be measured by a simple dust-fall jar. This is merely an open jar with water (or antifreeze in cold weather) to hold any dust that may fall into it. The dust caught is calculated in tons per square mile per month.

Rural areas may show dust fall as low as 2 to 5 tons per square mile per month. An industrial area might run over 100 tons. The following dust-fall measurements made in various cities of the country illustrate the range:

| City | Year | Avg. dust fall —tons per sq. mi. per month |
|---|---|---|
| Los Angeles | 1946-48 | 21-45 |
| Chicago | 1946-47 | 32-99 |
| | 1953 | 53.6 (avg.) |
| Detroit | 1945-46 | 36-77 |
| Cincinnati (Industrial) | 1946-49 | 102-321 |
| | 1949-51 | 70-111 |
| Cincinnati (Residential) | 1946-52 | 1.9-23.8 |
| New York | 1953 | 67.5 (avg.) |

Dust suspended in the air can be measured in several ways:

. . . *Catch the dust* with small electrostatic precipitators and weigh the amount caught.

. . . *Measure the blackness* of a spot left on filter paper after air is drawn through it for a few hours.

. . . *Bubble the air* through special devices called impingers, where the dust is caught. Then count individual dust particles under a microscope.

Dust concentration (measured in milligrams per cubic meter of air) varies from less than 0.1 in country air to over 1 in certain industrial areas. To get some idea of what 1 milligram per cubic meter is, assume that we have a pound of very fine atmospheric dust. If this were dispersed in a building the area of a football field and 400 feet high, the concentration would be 1 milligram per cubic meter.

**Amateurs please refrain**—To sum up, measuring air pollution is a science. It should usually be left up to the experts—or at least be under their supervision or guidance. Not only must the right analytical methods be used, but enough samples must be taken over a long enough period of time to get a reliable picture of the situation. Also care must be taken to study pollution under a variety of weather conditions.

## How to tell if your plant is an air polluter

Most industrial plants are not air polluters. You may be safe for several reasons: Either you don't release anything to the air, or you don't discharge enough to count. Also you may be isolated from communities or other plants that in concert with you might cause pollution.

If you *do* discharge materials to the atmosphere, how can you tell whether you are an air polluter? There are no quick answers to such a question. Here are just *some* of the things that have to be taken into account:

1. Kind and amounts of polluting materials you discharge from all sources.

2. Whether release is near the ground or from tall stacks; whether it's intermittent, variable, or continuous; whether the discharge is hot or cool.

3. Distance from your plant to your neighbors, residences, farms, other industries.

4. Polluting effects of the materials you release—odor, color, gas or dust; effects on man, animals, or vegetation.

5. Type of country you are located in—hilly or flat.

6. Type of climate — windy; or calm, damp, or foggy weather.

With all these factors playing a role, it's easy to see how you might fail to recognize yourself as an air polluter. Of course, when a smoke inspector complains that you are putting out too much black smoke from your power plant or waste burner, then you may be guilty of pollution. Or, if you recognize in the area near your plant the odor of a substance used in your process, don't be surprised if your plant is labeled

a nuisance by the local authorities.

The most common air polluter is one who doesn't produce enough evidence singly to tag him as such. He's one among many other polluters, both industrial and domestic, who alone would cause no trouble. But, when his output is combined with the others, he's an offender along with the rest. Such situations are tough to lick, cause the greatest public outcry.

## What the air pollution laws say—and fail to say

Before we go on, let's look at air pollution laws to get some idea of what we might be required to do. Most of them are ordinances passed by single towns, cities, or counties.

The reason for the local origin of the laws is that the problem is local. Generally the atmosphere dilutes contaminants so that pollution effects are limited to a few miles—sometimes a few blocks—from the source. (Water pollution is different because a source may pollute a river for tens of miles downstream. So water pollution control is usually on a state or interstate level.)

Air pollution laws also reflect the absence of standards of air pollution. Whatever specific provisions on limitation of smoke and dust do exist, reflect what can usually be done with existing equipment, not what may be needed to correct a pollution situation.

As for other effects—odors, dirt, corrosion, health—the laws are very fuzzy. They usually say something like this: Don't discharge anything that will annoy or hurt your neighbors. But they don't tell you *what* or *how much* will annoy or hurt your neighbors. That's left up to the pollution abatement officials—or even to a court if you don't agree with them.

As for smoke and dust from boilers and other combustion equipment, the laws are becoming increasingly more specific and strict.

Smoke is measured by its blackness. Usually a Ringelmann chart or graduated scale is used. On this scale jet black smoke is No. 5, no smoke is zero; the increasingly dark shades of gray between are numbered 1 to 4. A typical ordinance may read something like this: *Never discharge smoke denser than Ringelmann No. 2, except when building a new fire, blowing soot, or because of upset fire.* Even then you are usually limited to denser smoke for only a few minutes a day.

As for dust, ordinances frequently specify the concentration that can be discharged from a boiler stack. Allowable dust loadings range from 0.25 to 0.75 grain per cubic foot of stack gas—usually measured at a standard temperature of 500 F., and with 12% carbon dioxide present or at 50% excess air. The lower value is recommended by the Model Smoke Ordinance of the American Society of Mechanical Engineers.

Homes are usually exempt from these smoke regulations. However, in certain cities—St. Louis, Baltimore, Detroit, New York, and Pittsburgh, to name a few—it is illegal to use a soft coal that is too high in volatile material. Such coals are hard to burn in home furnaces without causing smoke.

There are now over 120 cities, towns, and counties of all sizes in this country that have air pollution and smoke laws. Three states—Massachusetts, New Jersey, and Oregon—have laws. The birth rate of such laws is increasing—at least 80% of them have been passed or substantially tightened since World War II. You can be sure more and tighter laws will come.

## How to diagnose your plant's problem

There are four main steps in diagnosing your plant's air pollution situation and learning what to do about it. These are easy to put on paper, but are rarely as easy to carry out.

**1. Find out what your plant discharges, and how often and how much.** No one knows your plant better than you do. You can list what you discharge by checking all stacks, vents, exhausts, and other outlets. You can determine the rate of exhaust. And whether it's continuous or intermittent.

As for *how much,* that may be a tougher task. Take dust and smoke, for example. These variables—dust and smoke—don't always go hand in hand. A stack can be smoky, but low in dust. The reverse can also be true — a dusty stack could be low in smoke.

Dust concentrations ought to be measured separately. The American Society of Mechanical Engineers has published instructions on making dust measurements in stacks (see Power Test Code for Dust Separating Apparatus). Smoke can be measured with a Ringelmann chart.

Materials other than dust or smoke must be considered individually. *Reason:* Their properties *after dilution* in the air are the important thing. Dilution is usually great, on the order of hundreds and thousands of times. For example, carbon monoxide from an automobile quickly kills a man in a closed garage. But millions of people in the open air breathe the exhaust from millions of cars every day without known ill effects. This is because the atmosphere dilutes the gas far below the level of harm.

The same thing happens with most substances released to the air from industrial plants. They are diluted so rapidly that they cannot be detected by smell, color, or effects on man. But some substances still retain undesirable properties—such as odor—even at very low concentrations. Therefore your concern with substances from your plant, other than dust or smoke, depends upon the material present.

The Manufacturing Chemists' Association, Inc. (1625 Eye St., N.W., Washington 6, D.C.) has published a series of manuals on various phases of air pollution. One of these (Manual P-6) lists the concentrations at which many substances produce odors or eye irritation, cause vegetation damage, or cannot be tolerated by human beings. This list is a good guide to identifying potential polluters in your plant. Special chemical tests and sampling procedures must be used in measuring the presence of these substances.

**2. Find out what pollution you are causing.** Knowing now what you put out, how much, and at what rate, you next need to find out if you are putting out enough to be considered an air polluter. Only rarely is there an easy answer to that question. Of course, if an ordinance covers your area, then you can check it for allowable dust and smoke.

One difficulty is trying to establish how much pollution you cause. The science of air pollution is still young. While many competent

people are studying the problem, there exist differences of opinion on what constitutes pollution.

For example, the amount of dust that falls on the ground or in a test jar in a month could be a measure of the dirtiness of an area. However, dust fall varies so much from month to month—even from day to day—that it is difficult to say how much is caused by one source and how much by another.

A recent development in pinning down this dust-fall measurement is the directional dust-fall device that was developed by the Battelle Memorial Institute, Columbus, Ohio. This device tells the amount of dust that falls on a given spot for the major wind directions.

Finding out the extent of pollution that you may be causing is usually more complicated than determining the amount of pollutants that you put out to the atmosphere. Here are some approaches:

. . . *Apply mathematical formulas* developed by scientists to estimate roughly the concentration of pollutants downwind from a given source. However, these are complex formulas that have certain limitations in their application. Also, the interpretation of the results from these formulas requires a certain amount of experience.

. . . *Measure or observe pollution* on location. This may be relatively simple if your plant is in an isolated area, but highly complex if in a well-developed industrial area.

. . . *Study complaints* from neighbors on odors, dirtiness, or even vegetation damage.

If your own staff is not qualified to carry out the necessary tests and procedures, you may get some help in finding qualified consultants in your field from technical societies that have shown interest in air pollution and that follow such developments closely. See the list of active committees of these societies on page 104. It includes other sources of information on abatement.

And don't overlook your local authorities on air pollution. They want to help you solve the problem realistically and at lowest cost. They prefer to cooperate in any plans for correction rather than slap down fines for violations.

**3. Find out how much you have to reduce the pollution.** This is also a problem of research. In many cases, you are limited in what can be done in a practical way by existing equipment and methods. Sometimes it may be impractical to eliminate certain sources of pollution because of the poor economics of treatment or the lack of available facilities.

Each job of air pollution abatement is a problem in itself and must be solved by itself. There are no short-cut cookbook methods that can be applied to reducing air pollution. By the same token, there are no clear-cut methods to determine how much you must reduce emission from a plant before you can eliminate pollution.

For example, there is no sure-fire way of determining what reduction in discharge of dust is required to reduce the nuisance of air pollution caused by dust fall. One reason is that Mother Nature herself can contribute considerably to dust fall.

Usually extensive studies must be made of the pollution in an area to determine how much that pollution can be reduced by elimination or reduction of certain discharges from a single plant or several plants in an area. Obviously it would be ridiculous for a minor polluter to clean up his plant when a major neighboring polluter does nothing. For this reason, cooperative effort may be required among the polluters in a given area to find out how much pollution reduction is economically possible.

**4. Find out how to reduce pollution with least cost.** To do this you need to familiarize yourself with all the methods for abating pollution. Then pick the one that fits your problem at lowest cost.

## Ways you can abate air pollution

Here's a quick review of methods being used by industry for pollution abatement:

**1. Adopt another method of product manufacture.** Of course, the best way to abate pollution is not to produce the waste material in the first place — or, at least, to produce as little of it as possible. It may be possible, for example, to make a product by an alternate method that will produce fewer or no waste products.

However, factors other than air pollution must determine the attractiveness of alternate processes. An example is the manufacture of sulfuric acid. The chamber process often releases brown nitrogen-oxide gas to the atmosphere. If this process were replaced by the contact process, these fumes would be eliminated, since nitrogen oxide is not used in the latter process.

When a new product or process is being developed, it is important to think about pollution problems right in the research laboratory stage. Alternate lines of research may prove more promising when also looked at from a pollution angle. A process that normally takes more expensive process equipment may prove cheaper if the cost of pollution-abatement equipment can be reduced or eliminated.

**2. Use a method that recovers or treats pollutant at a profit.** Sometimes pollution abatement can be accomplished at a profit. The product that may be going to the atmosphere could be collected and sold. For example:

. . . *In cement and carbon black* plants, dust collectors have increased product yield.

. . . *Certain smelters* formerly had to keep their output down because a sulfur dioxide discharge killed nearby vegetation and orchards. They found later they could make ammonium sulfate from the waste sulfur dioxide and sell it as a fertilizer ingredient.

. . . *Some wire enameling plants* were discharging odorous materials into the air. Now they use a catalytic oxidizing unit that burns these odors. In some instances, the heat thus produced is sufficient to recover and use.

**3. Make better use of the atmosphere for dispersing wastes.** In other words, use higher stacks. Also you can take advantage of the vertical rise of stack gases by increasing the speed of discharge (use of narrow rather than wide stack-top open-

ings), or by allowing the gases to escape at as high a temperature as is feasible (hot air rises farther).

One thing about stacks is that the rate at which pollutants are discharged from the stack, rather than their concentration, determines the pollution concentration in the free air outside. For example, a discharge of a pollutant at the rate of 100 pounds *per minute* will have about the same polluting effect whether it is mixed with 1000 or 2000 cfm. of stack air.

*What this means is this:* If you can discharge a given amount of pollutant over a longer period of time, the pollution effect will be less than if discharged in a shorter period of time. The slow discharge rate gives the atmosphere a chance to sweep it away before concentrations are produced that have a polluting effect.

In many instances, even a high stack is not a feasible treatment, either because a high-enough stack cannot be economically constructed or it is not allowed because of airports nearby. Then you have to collect the pollutant, or destroy it, or change it into something that is less objectionable.

**4. Transform or destroy the pollutant.** Usually this type of treatment works fine for gaseous pollutants. For example, hydrogen sulfide is a waste product formed in certain oil-refining operations. It has a rotten-egg odor detectable in very small concentrations. But hydrogen sulfide under certain circumstances can be burned to form sulfur dioxide. While this substance also has an odor, about 30 to 50 times more must be present before it can be detected.

You have probably seen refining operations where large quantities of smelly waste gases are disposed of by burning in flares. The petroleum industry is spending much time and effort to develop the best type of flares to burn these gases safely without producing smoke.

**5. Mask the odor.** Sometimes you can add a highly aromatic substance directly into a process, or into a stack, or into ventilating air that carries odorous materials away from a process. The odor of the masking agent will either cover up the undesirable odor or cancel it out. Masking agents have been used, for example, to hide the odor of mercaptans produced in the pulping of wood. The agent is added directly to the pulp digester where the malodors are formed, and both are released to the atmosphere together.

**6. Collect the pollutant.** While the above methods may be applicable in certain air pollution situations, it may turn out that the best or only course is to collect the air pollutant. There is no dearth of equipment available to do this. Often several different types will give you the desired results. But some types may be capable of a better job than you need.

In selecting your equipment, you must consider a variety of factors such as nature of pollutant, degree of collection or removal needed, space available for equipment, suitability of equipment, and cost. The pollutant may be a gas, dust, fume, or mist.

## How you can collect air pollutants

**Gases** — Gaseous pollutants are usually absorbed or scrubbed out of the air that carries them. Here are ways it is done:

. . . *Scrubbers.* Gas scrubbers may be towers with water spray in which the gas can dissolve. In some instances, scrubbing efficiency may have to be increased by packing the tower with inert material of large surface area—such as Raschig rings or Berl saddles. Sometimes chemicals can be added to the spray to improve collection. For example, sulfur-dioxide gas collection can be improved if the tower is supplied with a solution of caustic soda, soda ash, or ammonia. Sometimes special absorbing solutions have been used as in the "Girbotol" process where ethanolamines remove hydrogen sulfide from a gas stream.

. . . *Fog filters.* This is a recent development in collecting gases. It has been used to remove sulfur dioxide from gases with water and caustic soda solution. The liquid scrubbing agent is sprayed at high pressure into a chamber through special nozzles that atomize it into fine droplets. These drops absorb sulfur dioxide and are then themselves subsequently removed.

. . . *Adsorbers.* Another technique is to adsorb gases onto agents such as activated carbon or silica gel. These employ the same principle used in familiar types of gas masks. The gas is picked up by the specially treated medium, much as a sponge takes up water. When the medium has adsorbed all it can, it is reactivated by heat or steam to drive off the contaminant. The concentrated contaminant can then be subsequently treated and the activated medium reused.

**Dust and fumes**—They are made up of solid particles that cover a wide range of sizes. The smaller the size of the particle, the harder it is to collect from a gas stream.

Particle size is usually measured in microns — one micron is about 1/25,000 inch. If you are familiar with the US standard screen scale mesh number, a 325-mesh screen has openings each of about 44 microns.

Dust particles are usually over 1 micron in size; fume particles, less than 1 micron. Fly ash from the burning of pulverized coal is made up mostly of particles in the 10- to 100-micron range. Foundry dusts usually are in the range of 1 to 10 microns. Metallurgical fumes are mostly less than 1 to 2 microns. For comparison, ordinary atmospheric dust is usually in the range of 0.2 to 2 microns.

The type of dust collector needed is dictated by collection efficiency required, size of dust particles, temperature of dust-laden gas, operating pressures available, and corrosion and erosion problems that might be encountered. Some of the more common types of dust and fume collectors are as follows:

. . . *Bag filters.* These are frequently installed in "bag houses" that contain several individual bag filters. The bags are usually cloth, which filters out the dust as the gas passes through the fine meshes of the bag. The first layer of dust that is built up on the bag acts as an even more efficient filter. The dust collected by these bags is usually removed periodically by shakers that can be made to operate automatically when the cloth starts to clog up. The shaken dust falls into hoppers. In certain types of installations, the collected dust is continuously removed by reversed jets of air from rings that move up and down the outside of the bag.

Bags are very efficient, collect

over 99% by weight. They can effectively take out particles less than 1 micron in size. But application is limited to dry dust and moderate temperature. Most bags are cotton and cannot be used to remove dust from gas streams above 250-275 F. Recent developments in the use of bags made of synthetic fibers, asbestos, and glass fabric mean that bag filters are becoming available for higher temperature ranges.

. . . *Cyclone collectors.* In these, the dust-laden air or gas is whirled around and dust is thrown out by centrifugal force. Cyclones can be made of metal or ceramic ware which permits use where bag filters are not feasible. However, they are not as efficient as bags for the finer dust, because collection is usually limited to particles above 5 to 10 microns. Even then their efficiency may average only 50 to 90%.

Cyclones are used both singly or in banks of small units called multicyclones. The latter have been used successfully for collection of fly ash, grinding and drier dust, and similar dusts. The possibility of erosion with hard gritty dust should be considered in the use of cyclones.

. . . *Wet scrubbers.* In wet-barrier scrubbers or washers the gas is forced under a barrier and up through a shallow pool of water. The strong turbulent action causes the dust particles to be wetted and retained in the liquid. Both corrosion and erosion can become a problem in these types of collectors. Generally they are limited to particles greater than 5 microns. Their efficiency is quite variable, depending upon the operating condition and the type of dust being collected.

. . . *Electrostatic precipitators.* These units remove dust particles by collecting them on electrostatically charged surfaces. They offer less resistance to the flow of the gas than the previous methods described. They are efficient in removing dust (90-99% by weight) and also are able to separate out particles of less than 1 micron. But they are expensive and more sensitive to variations in operating conditions.

. . . *Venturi or orifice scrubbers.* Such scrubbers have been used successfully on types of dust and fumes having particles too fine for ordinary cyclone collectors, or where operating conditions are too variable for electrostatic precipitators. Take, for example, blast furnace dust, or fumes from varnish manufacture. In these, water is added to the gas to be cleaned just before it passes through a venturi or orifice constriction. Upon going through the constriction the water is atomized and collects the dust particles. Water drops with their dust load are then removed in an ordinary cyclone separator. The efficiency of these scrubbers is essentially a matter of pressure drop (or power) across the constriction. The more energy put into the system, the more efficient the dust collection. Of course, while high power means high efficiency, it also means high operating cost. These collectors often have an efficiency of over 90% and are able to collect particles less than 1 micron.

**Mists**—These are particulate material in liquid form. Bags cannot be used for removal of mists because of their wetting action. But mists can often be collected in equipment such as cyclones or barrier-type scrubbers. Certain mists may have extremely fine particles that cyclones and barrier-type scrubbers are unable to remove efficiently. It may be necessary to go to such equipment as electrostatic precipitators or venturi or orifice-type scrubbers. Corrosion may also be a problem in collecting mists.

## Tell your neighbors what you're doing

Sincerity is one key to good relations with your neighbors. If your plant has an air pollution problem, the important question is:

"Are you concerned about it?"

If you are doing everything reasonably justified — devoting time, effort, and money — to correct a nuisance, then be sure to tell your neighbors about it. They will give you credit for trying, but they want to be assured that you recognize your own problem — and theirs. They want to know that you will, at the very least, try to do something about it.

## Where to get technical advice on air pollution measurements

**These technical society and industry committees can refer you to qualified advisors**

Manufacturing Chemists Association
Air Pollution Abatement Committee
1625 Eye St., NW, Washington 6.

American Petroleum Institute
Committee on Disposal of Refinery Wastes
50 West 50th St., New York 20.

Air Pollution Control Association
4400 Fifth Ave., Pittsburgh 13.

American Soc. of Mechanical Engineers
Committee on Air Pollution Controls
29 West 39th St., New York 18.

American Meteorological Society
Air Pollution Abatement Committee
3 Joy St., Boston 8.

American Soc. for Testing Materials
Committee D-22, Atmospheric Analysis
1916 Race St., Philadelphia 3.

American Chemical Society
Committee on Air Pollution
1155 16th St., NW, Washington 6.

Automobile Manufacturers Association
Combustion Products Subcommittee
320 New Center Building, Detroit 2.

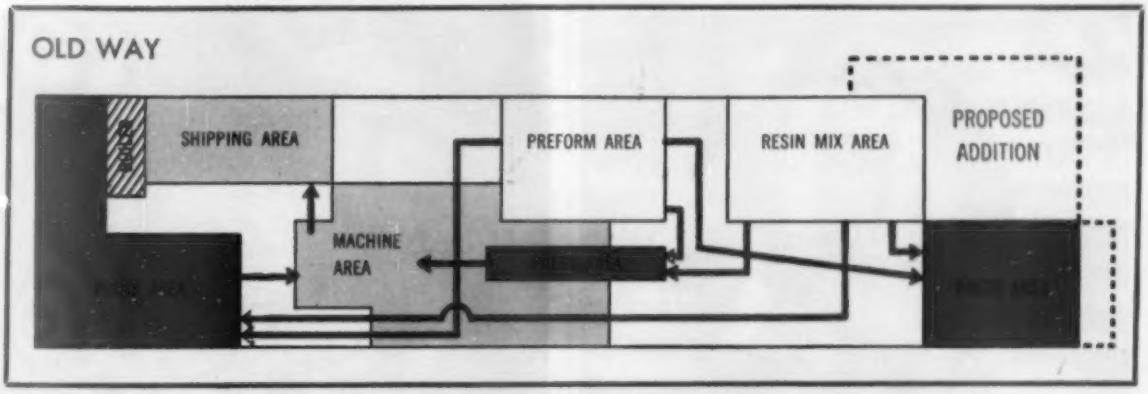
**The following organizations also supply information on air pollution and its control and abatement:**

Air Pollution Foundation
704 South Spring St., Los Angeles 14.

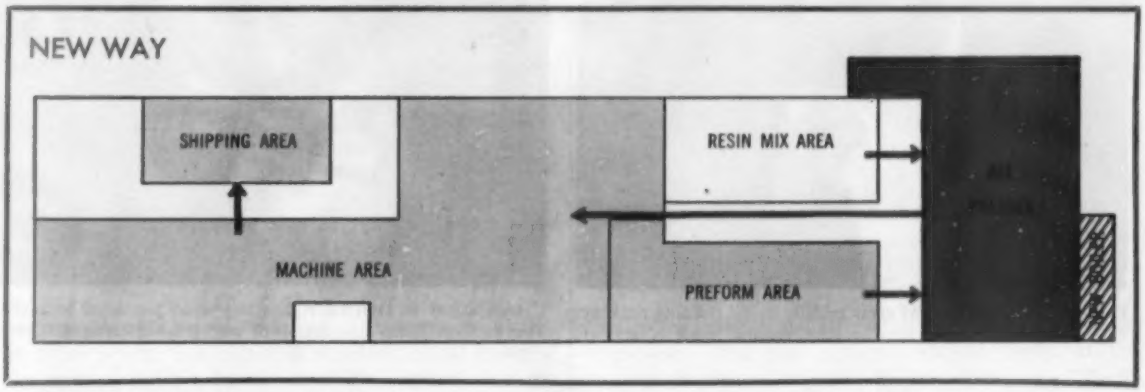
Coal Producers Committee for Smoke Abatement
720 Transportation Building
Fourth and Sycamore, Cincinnati 2.

American Foundrymen's Society
Air Pollution Program
616 South Michigan, Chicago 5.

For a list of available films on this subject, see Films section, page 254 (under heading "Air Pollution").




**PRESSES WERE SCATTERED** all over the Bassons plant, with production moving every which way.




**ADDITION TO PLANT** made it possible to group all presses in one area—and to straighten flow.

# Now 45% Less Travel

**A study in chain reaction! How a company bought new equipment, built a plant addition to house it, thereby backing into a new layout that halves product travel.**

**JUST A COUPLE** of new molding presses. Then a small plant addition at Bassons Industries Corporation (Bronx, N. Y.). And finally the new layout that's shown above. It cut a whopping 45% off average distance parts travel in production. Chain reaction, if you ask us.

Custom-molded plastic parts used to travel an average of 450 feet during manufacture — from molding to machining, finishing, and shipping. Today the same processing takes only 250 feet of travel.

**How it all happened** — Bassons needed two 170-ton hydraulic compression molding machines to increase production. These machines were too high to fit the present plant. Additional steam required to heat the presses meant a lot more boiler capacity. Best solution was obviously a new boiler—and separate housing for boiler and presses.

**Ripe for revamping**—The new addition set off the chain reaction. Bassons decided to get a big enough boiler to supply its 52 smaller molding machines as well (1725 pounds of steam per hour capacity, instead of 625 pounds). It then became essential to group all presses in a central area near the boiler—to minimize pressure drops in steam lines. This was the key move that unlocked the plant for further relayout. Once these presses were out of the way, the mixing, preform, and machine-shop areas could be relocated for more efficient production flow.

The new boiler and press locations reduced the distances that steam had to travel between them. On the average it was cut from 35 to 20 feet. (Maximum steam-travel distance dropped from 220 to 50 feet.)

**Under the tarp**—An interesting sidelight to the move was that the presses arrived before building construction was approved. Since Bassons needed molding capacity in a hurry, the presses were installed and operated while the addition was going up around them. Both machines and operators were sheltered by a tarpaulin during the construction period.

**EUGENE C. PECKHAM** spots pitfalls in the training package. Claims it seldom takes into account specific needs of trainee.

**CHANNING R. DOOLEY** says buy what you need on merit. The package is the foundation of any good training structure.

# Packaged Training—Yes or No?

**Two experts air a timely subject—in good season to help you plan your fall training. One expert takes a crack at packaged programs. The other sticks up for a technique he has long used with conspicuous success. Peckham speaks up below, left, with Dooley's rebuttal opposite. Who's right? You be the judge.**

## "No," warns Gene Peckham.

**TRAINING SALESMEN** are swarming all over the industrial scene. Each has his own specialty to sell—reading programs, visual aids, canned courses, spellbinding speakers, technical lectures, books, hit-and-run experts.

The training salesman seeks out the top man[1]—the man with the power of decision. He displays his wares. Arrays them attractively and expensively. Makes a skillful presentation—tailors it to the preconceptions of the man he's interviewing.[2]

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E. C. PECKHAM is a West Coast consultant with 24 years' experience in adult education and 7 in industry to back up his views on packaged training. He's president of Western Training Services, Burlingame, Calif.

## "Yes," says Chan Dooley.

[1]The top man *is* the only one to approach. But his experience should teach him to buy only what he *needs* —that nothing worth while comes easy.

[2]Good criticism of much American salesmanship—not just training alone.

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C. R. DOOLEY — Mr. Training himself — originated World War II's TWI program. Was Westinghouse's first training director, served Standard Oil 30 years. Now President, TWI Foundation, Summit, N.J.

## Peckham: "Watch that salesman!"

Once he's found out what the executive wants, he moves in boldly:

"Our methods—or materials—work like magic. No fuss, no bother. No other effort needed.[3] Just see that your men take this—or read or review it—and your training troubles are over."

He makes it look easy. But he's vague—or says nothing—about how his material can be translated into action. He'd have you believe that mere exposure to his program will do the trick. He bases his sales presentation on this training fallacy—*that understanding is the same as doing and that being able to say a thing is identical with a permanent change of attitude.*[4]

He's careful to stress certain values in packaged programs. He says they are:

. . . *Definite in length and content.*[5] That's why they're called packaged programs.

. . . *Easy to budget.* The price includes everything. You know what you're spending.

. . . *Specific in content.*[6] Usually the salesman can show you—in advance—the topics, the exact material, and the illustrative helps that'll be used.

. . . *Planned with a definite course* selected for the specific target group.[7] For instance, he'll try to find out the group with whom the top executive is most concerned. Then he'll fish from his briefcase a definite program for that group.

. . . *Set up to make the trainee altogether responsible for learning.*[8] At least, that's what the salesman will suggest, though he may not say it in so many words. In other words, the trainer is absolved of all blame if the learner doesn't learn. And it's implied that the program is so well organized that everybody will learn except the man who makes up his mind that he isn't going to learn.

. . . *Easy on the trainer.*[9] The program requires no skills on the part of the trainer. It'll carry him right along.

Besides all this, the salesman leads you to believe the following:

. . . *Outlines are more important* than individuals.

. . . *The training conference room*[10] is a more significant place for the trainee to learn his job than his work situation.

. . . *Preconceived notions*[11] of what trainees need are more important than what the trainees themselves know and sense that they need.

Packaged programs are prepared in advance with little or no thought for the specific people to whom they're to be applied. They overlook the absolute necessities[12] for successful training programs—determination of motives, practical application, guided experiences, top-management identification with the program, and skillful leadership by the trainers.

Most packaged programs offered for sale shape up as follows:

**Reading programs**—Mostly they're attractively printed and well decorated. Usually the scope is intelligently planned, covers subjects[13] and material appropriate to the target group. But they completely overlook the fact that not everybody likes to read, words don't have the same meaning for all people, and few people can convert what they read into action.

## Dooley: "Be a smart buyer."

[3]The top executive should know better from his experience in running a business. He ought to know that follow-up is the basis of continued customer relations.

[*PECKHAM: He does know better. But he likes to buy blue sky.*]

[4]These criticisms are valid. But they're not limited to packaged programs, which mean different things to different people.

[5]Definite length is not in itself an evil. A number of finite programs can be arranged in series to form a complete plan or an endless process.

[6]The sin in packaging is not the definite steps—but the impression that any program intended to give skills and change habits ever comes to an end.

[7]This might be O.K. Such a group doubtless has specific needs around which a good training program should be built.

[8]Of course the trainer must carry full responsibility. Just as an executive carries full responsibility for his employees. But this criticism should apply to the *manner* of instruction—not to any name, like "Package." It could apply even to a foreman breaking in a new man.

[9]Training-Within-Industry, used successfully in World War II, had the slogan: "If the worker hasn't learned, the instructor hasn't taught."

[10]The work situation *is* the most logical place to learn skill! In fact, the only place.

[11]If the executive buys this, he's the victim of the glib salesman. And not all glib salesmen are with commercial houses. Some are inside academic circles.

[12]All these are essential to any program worth time and effort. It's a mistake to imply that packaged programs don't give these considerations and that others do. It's how a program is given that counts—not its name.

[13]In addition to some basic facts, what's needed is *experience* in solving current, live problems under direction of a competent coach. And the best coach is a production supervisor who's been taught how to teach.

*Turn the page*

## "Beartraps here," warns Peckham.

**Visual aids**—Moving pictures and slidefilms are a familiar form. But the buyer should realize that these are not really training devices. They're simply the basis for discussion of possible future applications. If not used properly, their value can be largely wasted.[14]

**Canned courses**—These are complete programs that include all necessary training aids. They're a common form of training-for-sale, are usually found in large companies with many branches and in national organizations. Content and quality are high, and the integrity and authority of the writers are above question. But canned courses do not do a complete training job. That's why they're included with other packaged programs.

**Spellbinding speakers**—They're available in any large city. They're usually offered by one-man organizations. But results are hard to find. Eloquence just doesn't produce action.[15]

**Technical lecturers or trainers**—These hit-and-run specialists usually are ethical. If qualified, one of them can come into your plant to meet an emergency and present a specific subject or a body of training materials. But you should think of him as an interference runner for your own follow-up training efforts.[16] In a short time he can loosen up old situations and shake out the complacency or the old ideas of veterans in your organization. Then, with hostility to change focused on him alone, he can leave you and your associates to continue what he has started. Only in this way can achievements become permanent.

The Training-Within-Industry program[17] of World War II is an example of packaged plans. They were ethical, carefully and skillfully prepared, made meaningful and useful by the nation's best thinking about training. But still they were a great disappointment. Class after class went through the motions of dropping old habit patterns of supervision and adopting more human relations-conscious attitudes—only to shuck them off on return to the job. Much of this half-hearted conformance was due to a temporary, management-imposed, leader-dominated atmosphere.

F. J. Roethlisberger, Harvard's outstanding educational authority, has commented on TWI: "These programs don't do what they're supposed to do—help supervisors with the human aspects of their jobs. Many raise loaded questions,[18] give facile answers, indulge in platitudes, present principles that can't be applied to concrete situations. In many of them the leader is armed with the point the trainees are supposed to make. If the trainees fail to respond, he's instructed to make it himself."

Here are the chief weaknesses of packaged training programs:[19]

*. . . They assume that all participants learn equally and fully.*

*. . . They rely too much on words.*[20] They'd have us think that talking trains men, that indoctrination is efficient training, that learning by doing is not necessary, that skills can be absorbed without practice.

*. . . They arrange subjects in an arbitrary order,* without reference to current situations arising on the

## "But look at TWI," says Dooley.

[14]A device that makes work easier for the teacher doesn't necessarily make learning easier for the student.

[15]It's true—eloquence doesn't produce action. But it sometimes inspires people to courage and faith. And may get management to approve a good action when time comes to pay the bill.

[16]He breaks the ice. Takes some of the blame. Scares some of the diehards. Sounds a warning. It's a breath of fresh air—though each man must make shift to do his own breathing.

[17]TWI programs were designed as foundations—not as packages. From the start, they urged follow-up by management. Under pressure for war production they gave immediate results at low cost. But many plants used them as packages, then discarded them. That was the fault of the people not the program.

[*PECKHAM: TWI programs were packaged programs. They had much good in them. But they were severely structured. Metered minute by minute. Void of any freedom for the trainer. And manuals were precise, exact, unchangeable. TWI was a great and needed service in an emergency — but a classic example of the package. I'm sorry, Mr. Dooley!*]

[18]Prof. Roethlisberger, who helped greatly in the early stages of TWI, would not expect miracles in changing human nature. Loaded questions are a disgrace to both managers and educators. And TWI never officially approved of them. They're not in the manual.

[19]These are weaknesses of poor instruction by whatever name it's called.

[20]I agree completely. But these principles should be stated positively rather than as criticisms against any one label.

[*PECKHAM: I share Mr. Dooley's concern with training in general. But here I'm talking about the weaknesses of packaged programs.*]

job. For example, the subject of absenteeism may be scheduled just at a time when grievances are the major problem in the plant.

*. . . They assume that the only human beings involved in a training situation are those in the training conference room.*[21] They ignore the trainees' associates and leaders, who really determine how well the training "takes."

*. . . They claim to save time.* They'd have you believe that all people learn at the same rate. They imply the promise that at the end of the course every man who was exposed to training will have learned the subject thoroughly.

*. . . They seldom tie leaders into the training process.* Result: Leaders feel little responsibility for seeing that training is applied on the job.[22]

*. . . They are imposed on trainees.* Preliminary consultations and surveys are not required.

*. . . They leave it to the learner to make his own applications.* In effect, he must be able to carry on by himself the hardest phase of all training—converting ideas into on-the-job situations.

*. . . They over-emphasize the value of "captive" training groups.* They would have you believe that real training—the kind you want—can be totally accomplished in a room away from the job.

*. . . They include no evaluation.*[23] They imply a guarantee that the process will get results.

*. . . They provide no follow-up.*[24] Yet informal training is more rewarding than formal training. And the formal should always taper off into the informal, carried on by the leaders. If a packaged program does provide for informal follow-up, you can accept it—to a large extent—as an ethical type of training.

*. . . They treat symptoms rather than basic causes.* In a sense, they are first aid. Instead, true training should be similar to the public health programs of our cities and counties. They provide long-term, all-pervasive plans and facilities that, as far as possible, keep "crash" situations from arising.

[21]Everything in these pages points to sound training principles. Stated constructively, they must underlie all worthwhile training effort, packaged or not.

[22]Too often true. A pathetic neglect.

[23]Evaluations are not only desirable but are not too hard to provide.

[24]Follow-up is essential not only to fulfill the promise of an announced plan. It should give assurance that the processes and procedures of production themselves become the means of training. That the formal trappings of programs become lost in the fullness of doing the job. That the program be not mistaken for the substance. Spelling, drawing, the multiplication tables—they're the drills that lie behind intelligent expression. But nobody assumes that drills in fundamentals are ends in themselves. Packages, properly presented, are foundations on which management can build a complete training structure.

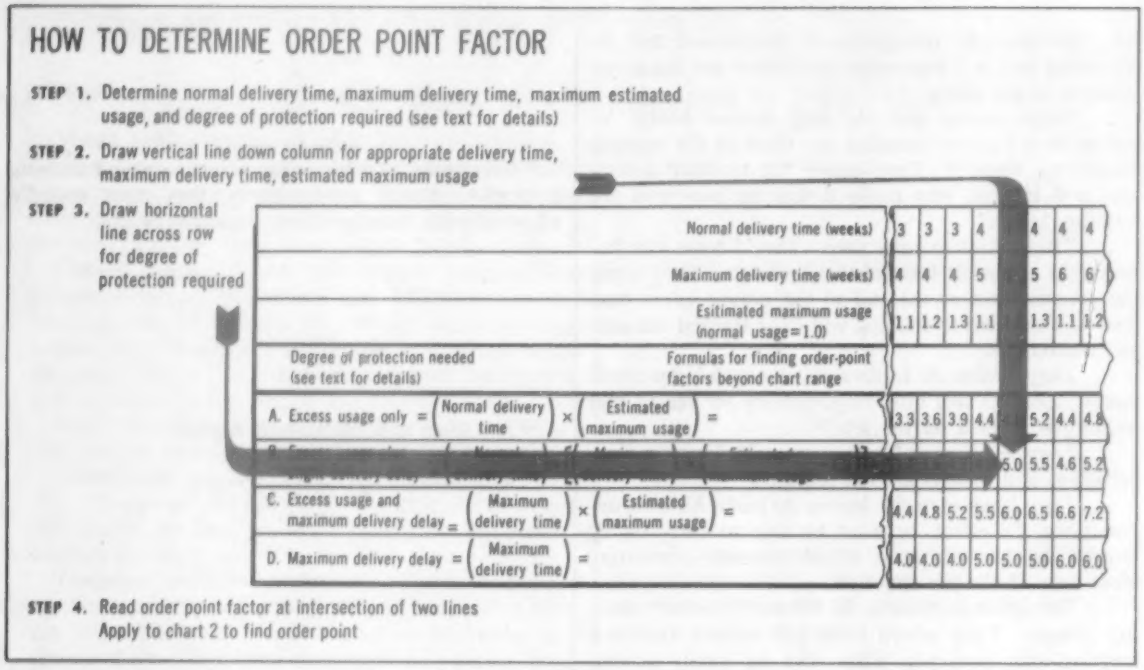

Coming in September FACTORY . . .

# What Automation Means to America

**Automation is here.** It's growing. It will keep on growing. *Because it must grow.*

"The only alternative to all the automation we can foresee—and much that we can't—would be to slow our progress toward a higher standard of living. It's obvious that the American people will not be willing to accept such an alternative."

**One of the most provocative articles FACTORY has ever published**


HOW TO DETERMINE ORDER POINT FACTOR
STEP 1. Determine normal delivery time, maximum delivery time, maximum estimated usage, and degree of protection required (see text for details)
STEP 2. Draw vertical line down column for appropriate delivery time, maximum delivery time, estimated maximum usage
STEP 3. Draw horizontal line across row for degree of protection required
Normal delivery time (weeks) 3 3 3 4 4 4 4
Maximum delivery time (weeks) 4 4 4 5 5 6 6
Esitimated maximum usage (normal usage = 1.0) 1.1 1.2 1.3 1.1 1.3 1.1 1.2
Degree of protection needed (see text for details)
Formulas for finding order-point factors beyond chart range
A. Excess usage only = (Normal delivery time) × (Estimated maximum usage) = 3.3 3.6 3.9 4.4 5.2 4.4 4.8
5.0 5.5 4.6 5.2
C. Excess usage and maximum delivery delay = (Maximum delivery time) × (Estimated maximum usage) = 4.4 4.8 5.2 5.5 6.0 6.5 6.6 7.2
D. Maximum delivery delay = (Maximum delivery time) = 4.0 4.0 4.0 5.0 5.0 5.0 6.0 6.0
STEP 4. Read order point factor at intersection of two lines
Apply to chart 2 to find order point

**KEY TO TIGHTER CONTROL** of inventories is a table from which flexible order-point factors are selected...

# How Much to Re-order When

**Want a foolproof system that's sure to give you tighter control of inventories? Sure you do. Then try the Reynolds plan. It rolls with the production punches.**

**MOST INVENTORY CONTROL** systems are based on predetermined order points. They signal when to place orders for materials and parts normally carried in stock. When the quantity of any material on hand drops below its order point, it's time to order more. Big problem with most systems: Quantities are only correct when production requirements and parts-delivery schedules remain fairly constant—which they seldom do.

The problem was solved for Reynolds Metals Company's aluminum-foil plant in Louisville by this system for using flexible order points. It was developed by E. Ken Hedrick, plant industrial engineer. It keeps order points tied closely to the ups and downs in usage and delivery schedules.

**Results**—Scheduling based on the flexible order points has resulted in a more balanced inventory, reduced investment. The need for taking large trims off coils to get correct sizes has been eliminated. The system is simple and methodical. And it eliminates a lot of guessing and sleepless nights into the bargain for the plant scheduler.

At Reynolds the problem is exaggerated by competitive conditions. Foil usually must be shipped shortly after receipt of order. Since delivery time of raw materials is 50% greater than this allowable lead time, materials must be ordered in advance of accurate sales information. According to the plant production manager, the system overcomes these handicaps nicely.

**Old way**—Prior to developing this system, rule-of-thumb ordering was used. The plant scheduler and production control manager used their experience and judgment to determine order quantities. Results: unbalanced inventories and trouble meeting customers' shipping dates. Trimming wide sheet-aluminum coils to supply customer orders for narrower widths produced excessive waste—but was often necessary.

**New system**—Under the flexible order-point system, three control factors are involved: (1) Estimate of actual usage as compared with normal usage, (2) normal and maximum delivery times, and (3) degree of protection against shortages required at the time. The last—number 3—is perhaps the key to the success of the new system. Four degrees of protection have been established—for the purpose of guarding against the following conditions:

... *Excess usage*. This assumes a dependable delivery schedule, but varying production requirements. To protect against this condition, you've

## HOW TO USE FACTORS TO ORDER MATERIALS

| | A | B | C | D | E | F | G | H |
|---|---|---|---|---|---|---|---|---|
| ITEM DESCRIPTION | Est. current usage (weekly) | Ordering code (See order-point factor chart) | Order-point factor (from order-point factor chart) | Order-point quantity (AxC) | Quantity on hand | Quantity on order | Total (E+F) | *Quantity to order (D−G) |
| 0.008 in. × 25.25 in. Sheet Aluminum Coils | 5000 lb. | 4-5-1.2-B | 5.0 | 25,000 | 8500 | 10,500 | 19,000 | 6000 lb. |
| 4-in. Strap Hinge | 5 | 4-5-1.2-C | 6.0 | 30 | 6 | 10 | 16 | 14 |
| ⅜ × 2¼ Hex. Head Screw Caps | 10 gross | 3-4-1.2-A | 3.6 | 36 | 6 | 15 | 21 | 15 gross |
| 200-watt, 120-v. Med. Base Incandescent Lamp Bulbs | 75 | 3-4-1.2-B | 3.8 | 285 | 150 | 75 | 225 | 60 |
| 0.016 in. × 28.25 in. Sheet Aluminum Coils | 5000 lb. | 4-5-1.2-C | 6.0 | 30,000 | 6000 | 28,000 | 34,000 | 0 |

*or economic minimum-ordering quantity, whichever is greater

. . . **AND USED HERE** to determine when to buy specific materials.

got to provide a quantity large enough to cover maximum usage for the normal time it takes to receive material ordered.

. . . *Excess usage and a slight delivery delay.* You can compensate for this condition by using the following practical rule: First order enough to cover normal usage for the normal delivery time. Then order enough more to cover excess usage (maximum usage less normal usage) for the maximum delivery time.

. . . *Excess usage and maximum delivery delay.* Here, to cover both contingencies, you need maximum protection. To get it, allow a quantity that's sufficient to cover maximum usage over the maximum delivery time allowed.

. . . *Protection against maximum delivery delay only.* This requires only enough to cover normal usage for a period equal to the maximum delivery time.

**How it works**—Let's work out a sample case—say for 0.008x 25.25-in. sheet aluminum coils. Here you can follow the procedure step by step.

. . . *Determine normal delivery time and maximum delivery time.* Suppose from past experience, you know a supplier is capable of delivering in 4 weeks—but also that he has been known to be a week late. (He might, of course, be later still—but past experience indicates that this is unlikely.)

. . . *Determine estimated maximum usage.* This is a guesstimate of the ratio of future requirements as a percentage of normal requirements based on forecasts and experienced judgment. Suppose that in this case maximum usage is estimated at 20% above normal, or 1.2 times normal. (Normal usage should be based on the average usage over a time period equal to the current raw-material delivery time. This minimizes the chances of erratic variations in inventory.)

Established so far, then: normal delivery time, 4 weeks; maximum delivery time, 5 weeks; estimated maximum usage 1.2. With this much information we can . . .

. . . *Move to "Order-Point Factor" chart* (facing page). In the top half of the chart we can find a vertical column combining the desired normal delivery time, maximum delivery time, and maximum usage. (It's indicated by the red vertical arrow).

. . . *Take into account the degree of protection needed.* They're listed in the bottom half of the chart (opposite page). How do you decide which one is appropriate? The decision is usually based on existing conditions, sometimes requires careful economic analysis. Sometimes historical performance, sales forecast and production schedules are reviewed in making the decision. Let's assume that the study indicates that the degree of protection needed is *"B. Excess usage plus slight delivery delay."*

. . . *Now go back to "Order-Point Factor" chart.* A line is drawn horizontally through that degree of protection (indicated by horizontal red arrow) until it intersects the vertical line drawn previously. Note on the chart that they intersect at "5.0." This is then the "factor" needed to compute the order point.

(Note that this chart has been worked out for only a small range of possible delivery times and usages. By using the formulas contained in the chart, it can readily be extended to suit any requirements.)

. . . *Compute the order point.* With the order-point factor established, this is straightforward and simple. See chart on this page. Our sample is worked out on the first line. Row A is the estimated current weekly usage, available from recent records. Row B lists, in order, the normal delivery time (4), maximum delivery time (5), estimated maximum usage (1.2), and degree of protection (B) involved. It is simply a ready reference to how, in Row C, the order-point factor (5.0), was determined. By multiplying weekly usage (5000 pounds) by the order-point factor (5.0 in this case), the order-point quantity is readily determined to be 25,000 pounds (D). If the sum of the quantity on hand (E) and on order (F) is less than the order-point quantity, an order should be placed.

. . . *Figure order size.* That's easily determined by subtracting (see H) the quantity on hand and on order (G) from the order-point quantity (D). In practice, there is an economical minimum-order quantity for each item. The order, then, should be equal to the figure in (H), or the minimum-order quantity, whichever is greater.

**Calculations made weekly**—Active items are examined in this way about once a week. As soon as inventories are reviewed, orders are placed to bring them into balance. But you can vary this method to suit your own convenience.

**1 · PERSONAL TIME**

| CLASS OF WORK | ALLOWANCE |
|---|---|
| Skilled manual | |
| Men | 6.0% |
| Women | 8.0% |
| Machine work | |
| Men | 4.5% |
| Women | 5.5% |

NOTES:

1. Manual allowance is applied not only when units are hand-made or hand-assembled, but also when the operator is using a machine or tool that cannot work unattended.
2. Where allowance is made to a crew, it applies to the crew as a whole, and must not be multiplied by the number in the crew.
3. If the whole crew has to be on duty the entire time a machine is running, and normal machine stoppages are 5 minutes or less, the allowance is raised from 4.5% to 6.0%.
4. The allowances are set without regard to the length of the work period.

**2 · FATIGUE (Physical Exertion)**

| ALLOWANCE PER 1000 FT.-LB. PER HOUR | |
|---|---|
| Men | 1% |
| Women | 2% |

NOTE:

On a combined manual-and-machine operation, the physical labor has to be averaged over the manual-work period and excluding the machine running time (assuming the operator is otherwise unoccupied during machine time).

EXAMPLE:

A girl handles 40 coils per hour. Each weighs 20 pounds and is lifted and moved a distance of 4 feet.

$40 \times 20 \times 4 = 3200$ foot-pounds per hour
$3.2 \times 2\% \quad = 6.4\%$

EDITOR'S NOTE: In calculating foot-pounds of work, BICC makes no distinction between lifting and carrying. Has any reader found a good way to handle this problem?

**P F & D ALLOWANCES** (for personal time, fatigue, and delays) are picked off the first four of these five tables developed at British Insulated Callender's Cables Limited — then adjusted (Table 5) for amount of normal idle time on job.

# A New Look at Allowances

**If you're still slapping a flat 10% or 20% allowance onto your stopwatch times, this better way from Britain may be "exactly what the doctor ordered."**

**UNIFORM ALLOWANCES** tacked on to leveled stopwatch times are unfair. Same thing is true even when predetermined elemental times are used. General practice is to add a flat percentage — 10% and 15% are popular "round numbers" — that will be generous for the great majority of workers. So the company is over-allowing on most operations. But unless the allowance is absurdly liberal, it will still be too tight for a handful of workers. Then the complaints and grievances start to pile up.

A few companies, however, have taken the trouble to segregate the factors that influence the allowances required for personal time, for recovery from job fatigue, and for unavoidable delays that are too short to "clock out." Then they have developed a formula for combining these factors to arrive at an overall allowance for each job. One such company is British Insulated Callender's Cables Limited. (Another is Dodge Manufacturing. See June FACTORY, page 108.)

In BICC's approach, allowances are made in four classes rather than the three we normally think of here in the U. S. The explanation is this: Fatigue allowances are of two distinct types—(1) fatigue resulting from physical exertion, (2) fatigue resulting from working conditions. Many American companies (Dodge, for example) compensate for normal working conditions in their job evaluation, so do not make a second allowance for the same factors in time study. If you follow this practice, then the BICC allowances for working conditions would not be applicable to your shop, except possibly as an indication of the weights you might assign to the factors in your job evaluation plan. The allowances used by BICC in all four classes are shown in Tables 1 through 4, with explanatory notes on each.

Final step in the BICC allowance plan is to adjust the arithmetic total of the individual fatigue allowances to reflect the amount of normal idle time in the worker's job cycle. This load factor, so-called, recognizes that on machine operations—or machine-paced operations—there is almost invariably some waiting time. To some extent, this waiting can be used by the operator for recovery from job fatigue. BICC assumes that a "normal" job includes 20% waiting time in the cycle. If the job has more than 20% waiting, the computed allowance is reduced proportionately. If the job has less than 20% waiting, the computed allowance is increased in like manner. The operation of the loading factor in the BICC formula is shown in Table 5.

## 3 · FATIGUE (Working Conditions)

SPECIAL NOTE: If working conditions are already compensated for in job evaluation, do not compensate for them a second time by adding these allowances to time study figures.

| CONDITION | ALLOWANCE |
|---|---|
| **Posture** | |
| Seated as in small assembly work | 0.0% |
| Standing, as for laying up machine | 1.0 |
| Standing occasionally awkward, as for rod rolling | 1.5 |
| Standing, awkward, as for radial drill | 2.0 |
| Standing and exerting upward force | 2.5 |
| **Concentration on work (adequate lighting assumed)** | |
| Automatic feed press | 0.5% |
| Hand feed press | 1.0 |
| Textile winding | 1.5 |
| Finish rolling in sheet mill | 2.0 |
| Moderately difficult assembly, such as cords | 2.5 |
| **Heat** | |
| Finish rolling aluminum sheets | 0.5% |
| General foundry work; lead press | 1.0 |
| Hammer shop; galvanizing | 1.5 |
| Breaking down rolls | 2.0 |
| Extrusion press; annealing | 3.0 |
| Foundry casting; furnaceman | 4.0 |
| **Fumes** | |
| Lead press | 1.0% |
| Pulverized insulation | 1.5 |
| Plating shop | 2.0 |
| Spray painting | 2.5 |
| Arsenical fumes | 3.0 |
| **Dirt** | |
| Pulverized insulation | 1.0% |
| Machine Shop | 1.3 |
| Spray painting | 3.0 |
| **Noise** | |
| Section with much machinery (not otherwise specified) | 0.5% |
| Covering machines in banks | 1.0 |
| Finish roll aluminum sheets | 1.3 |
| Stamp presses | 1.5 |
| Vertical braiders | 2.0 |
| Hammer shop | 2.5 |
| Tandem machines | 3.0 |

NOTES:

1. Figures in table above are random samples, chosen largely to indicate range of allowances. In many cases, the allowance is affected by conditions peculiar to the location and would not be applicable to same operation in a different location.
2. In all cases, BICC considers only condition that applies while operator is actually working.
3. Allowances under "dirt" are assumed to compensate for loss of efficiency from reaction to working in a dirty location and also to provide additional personal time for required clean-up.

## 4 · DELAYS

| CONDITION | ALLOWANCE |
|---|---|
| Miscellaneous delays | 3% |

NOTE:

This "contingencies" allowance compensates for production lost because of miscellaneous interruptions, such as receiving instructions, tidying workplace, and other hindrances of occasional and random occurrence. On such delays of more than 5 minutes, operator will normally "clock out."

## 5 · LOAD FACTOR

The correction for the load factor is expressed in this equation:

$$\frac{\frac{C - W}{C} \times 100}{80} = L$$

In the equation—

C is total cycle time, as determined by leveled stopwatch or predetermined elemental times, without allowance for personal time, fatigue, and delays.

W is the idle or waiting time in the cycle. On a manual job (unless conveyor-paced or limited by cycles of other operators in a line), waiting time is necessarily zero.

L is the load factor correction, by which the arithmetic total of all fatigue and delay allowances is multiplied. It is based on the assumption that 80% working time and 20% waiting time is a fair basis for regulating allowances. L may be less than 1.0, but it cannot be more than 1.25 (manual work).

NOTES:

1. In many cases the load factor may be difficult to compute exactly. Then BICC assumes a factor expressed as a percentage. This "percentage load" divided by 80% is an easy way to express the correction to be applied to the allowances.
2. Where there are two or more men in a crew, the load factor is expressed as a percentage for the crew as a whole.
3. If the operator performs auxiliary work during the machine part of a cycle, the sum of the times for the principal activity and the auxiliary work is used to determine the waiting time for purpose of correcting the allowance.

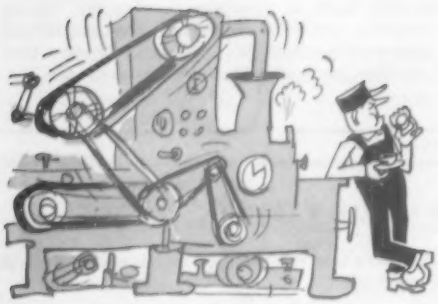
EXAMPLE:

1. One female operator. Bank of 8 covering machines. Load factor 60%.

| | | |
|---|---|---|
| Personal time | | 5.5% |
| Fatigue and delay | | |
| Physical exertion | 0.0% | |
| Posture | 1.0 | |
| Concentration | 1.5 | |
| Noise | 0.5 | |
| Misc. delays | 3.0 | |
| Uncorrected F&D | 6.0% | |
| Load factor correction: | | |
| $\frac{60\%}{80\%} \times 6.0\%$ | | 4.5% |
| Total allowances | | 10.0% |

# FACTORY | HUMAN RELATIONS

By LESTER R. BITTEL, Industrial Management Editor, FACTORY



## Accentuating the Positive

Do you fall into the trap of "bleeding" for employees in your plant? Feeling sorry for them because they are doomed to the assembly line or routine, repetitive jobs? If you do, you're guilty of looking only at the negative side. That's the opinion expressed by *MANagement*, a supervisory newsletter published by Kelly-Read & Company, Rochester, N. Y.

Increasing mechanization doesn't mean more robots, the editors say. It means easier work — almost an end to the expression, "back to the salt mines." Clean, sanitary working conditions, the coffee break, cafeteria, medical facilities, and a wealth of fringe benefits have taken the curse off the routine workers' jobs.

"Thing to do," says *MANagement*, "is to train your supervisors to look at the positive side. Get them to know their people better. With the workers' interests at heart, supervisors can make even the most routine jobs interesting and challenging."

## What's Behind the Rules

It's no longer sufficient to tell a worker *what* to do, say the experts. You've got to tell him *why*. And that's just what Jack & Heintz, Inc., Cleveland, does in its new safety handbook. For 50 basic rules "designed to protect *you*," the company tells what's behind the rule — an accident or near-accident and how the rule protects against recurrence. For instance, the "no horseplay" rule is tied to an injury resulting from a water fight in the washroom. This method works, too. Recently Jack & Heintz ran up a total of over 8,000,000 man-hours before having a lost-time accident.

For copies of the booklet, write Carl Herbold, Director of Industrial Relations, Jack & Heintz, Inc., 17600 Broadway, Cleveland 1.

## Data on Job Applicants

Here's a good idea for getting valid pre-employment data on job applicants. It was worked out recently by New York City's public schools system and the Commerce & Industry Association of N. Y. Perhaps you can spark the same plan in your town.

Available to prospective employers is a standardized report form that digests data from a student's permanent record file. It includes information on absences, lateness, over-all standings in English, arithmetic, and other specific subjects. Of particular importance is the record of accumulated evaluations of the student made by his teachers at the end of each term. Includes characteristics like dependability, cooperation, courtesy, and appearance.

Next we'd like to see a similar standard procedure for reciprocal exchange of applicants' work records between companies.

## Bolts for a Banana Split

Grumman Aircraft Engineering Corporation (Bethpage, N.Y.) uses a neat stunt to dramatize to its employees the startling cost of special rivets and bolts used in the manufacture of jet planes. (The Grumman Tiger, for instance, uses over 2000 "Jobolts" which cost from 31¢ to 57¢ apiece.) Because there are lots of them, workers get the idea they're cheap. As a result, many were tossed into scrap.

Grumman's conservation coordinator had the plant photographer pose a picture of an employee at a butcher shop buying a big, juicy steak with a half-dozen bolts. Another of a girl at a soda fountain using four alloy rivets to pay for a banana split. Then he published the pictures in the plant newspaper. These down-to-earth examples put the high cost of scrap in terms every worker could understand. Publicity like this has gone a long way to cut down small-part waste at Grumman.

## Performance Counts

"Take the job nobody else wants to do." That's advice from Henry B. du Pont, a vice president of the Du Pont Company, speaking recently in Philadelphia. "The employee who will undertake what needs doing, and do it cheerfully, is bound to make a hit with any boss."

Mr. du Pont also came up with a couple of other canny observations: "A man succeeds by proving to his boss that he has something to offer. In the long run, your best opportunity is one which puts you in a position to give rather than to get."

"What you can hear is often more important than what you can say. A man who listens, who keeps himself informed, is mighty handy to have around."

All of which adds up to the fact that it's performance—not luck or "connections"—that counts.

## Dual-Purpose Plant Pass

At General Electric's Appliance Park plant, the visitor's pass serves as more than an identification. On the back is printed a map of the plant's most essential buildings, parking areas and service facilities. Gatekeeper makes notations, or sketches directions on the map. This way, the plant pass serves not only G-E, but also the visitor.

## Sandwiches on Ice

At Hercules Powder Company, Gibbstown, N. J., workers keep their lunch boxes in a commercial-type refrigerator installed in the plant locker room. It keeps sandwiches fresh and cool. Where workers must stay close to the job (as in many process industries) or prefer to bring their own lunches, this is a well-appreciated service.

## Reporting to Employees

Here are two twists on annual reports that help improve employee relations. In its annual report to stockholders, Cornell-Dubilier Electric Corporation, South Plainfield, N. J., includes the names of all employees with over 5 years' service. It says:

"No report of our company would be complete without proper recognition of the loyal and continuous service record of our employees. The extra measure of quality built into our products would not be possible without this accumulated experience and service."

In its employee newspaper, McBryde Sugar Company, Ltd., Kauai, Hawaii, reports not only annual financial figures to employees, but also production and cost statistics—details ordinarily withheld from employees. Company tells number of acres of sugar under cultivation, number of acres harvested, average return and average production cost per ton.

McBryde also publishes total wages paid, total hours worked, average hourly earnings, and fringe benefit cost. And traces the increase in fringe-benefit cost from 8¢ per hour in 1948 to 33¢ in 1954. These wage figures stand out in sharp contrast to cost-of-production and income figures. Taken in context, they're much more convincing than reported alone.

## Vacation Reading Rack

Want a simple way of getting free material for your plant reading racks? Add a choice assortment of travel brochures. Write public relations directors of railroad, bus, steamship, and air lines. Or call your local travel agency for a list of resort chambers of commerce. Be sure to explain how the brochures will be used and that the purely commercial listings won't suit your purpose.

This idea is working nicely at Hamilton Standard Division of United Aircraft Corporation, Windsor Locks, Conn. Rack is in employees' clubhouse.

# Making Water Work Again...

**. . . and again. By recirculating it through in-plant cooling towers. Which paid off in 19 months! Must reading for today — if you use any process water at all.**

**YOUR PLANT OUTGROWING** the city's water supply? No more deep wells available? No other new sources of supply?

Then follow the lead of Tecumseh Products Company, Tecumseh, Mich. Tecumseh had to face up to this problem. It was the biggest water consumer in a town of 3000 people, used an average of some 62-million gallons per month. And every year was bringing another increase in the plant's needs. Yet if Tecumseh took more water, there'd be less for the town — less for household needs, less for fire protection purposes. Nobody liked that prospect.

So Tecumseh engineers looked around for a way to cut plant water consumption. They found that an estimated 22-million gallons per month flowed directly to the sewer after only one use. That was a lot of water down the drain. Their decision: to recirculate the cooling water that flowed through ice machines, air compressors, and air-conditioning equipment.

But that wasn't a complete answer to the problem. There was still another puzzle to unravel: How to cool the recirculated water after every flow cycle?

A preliminary survey showed two possible ways:

. . . *One or two large* central cooling towers on the roof.

. . . *Several small* in-plant towers, each close by a major cooling system. (Cooling systems are scattered all over the plant.)

Either method would cost money. But how much? An over-all cost analysis favored the in-plant towers. Sure, the two large towers would cost less than the sum of the many smaller units. But the cost of piping water from faraway reaches of the plant to the big central towers would over-balance the savings.

So Tecumseh picked the smaller towers, spotted them throughout the plant.

Cost? Well, look at the table up above. It shows total cost — and breakdown — of the multiple tower installation. It covers seven units obtained from Acme Industries, Inc., Jackson, Mich. Water cost is based on 4½¢ per thousand gallons. One-third of the 4½¢ is the sewer charge. Monthly consumption figures are averages for the entire 1954 season.

The table includes no operating costs. They're insignificant — merely the cost of power for small motors that drive blower and pump on each cooling unit. Make-up water runs only about 3%. Maintenance costs also are negligible.

Late in 1954 Tecumseh added two more Acme cooling towers to the family. And in 1955, five more. Total now is 14. Cost of the first nine units was about $20,000 — some $10,000 for the towers; $2000 for plant labor in installation; $6500 for ductwork, piping, and other materials; and $1500 for electrical wiring.

Over-all, the towers saved their cost in 19 months. Better still, they eased the company out of what might have been an embarrassing water shortage.

**COOLING TOWERS** like this one next to a compressor save lots of water.

What Tecumseh's Cooling Towers Do — and What They Cost

| Tower No. | Equipment Served | Gallons per Month | Water Cost per Month | Tower Installation Cost | Amortization Time (Months) |
|---|---|---|---|---|---|
| 1 | Two 50-hp. ice machines | 4,320,000 | $194 | $3,083 | 16 |
| 2 | Two air compressors | 2,602,000 | 118 | 2,045 | 17 |
| 3 | One 50-hp. air conditioner | 2,160,000 | 97 | 2,206 | 23 |
| 4 | One 20-hp. air conditioner | 1,080,000 | 50 | 1,295 | 26 |
| 5 | One 325-hp. air compressor | 2,652,000 | 120 | 2,045 | 17 |
| 6 | One 725-hp. air compressor | 6,480,000 | 195 | 2,662 | 14 |
| 7 | One 400-hp. air compressor | 2,700,000 | 122 | 2,045 | 17 |
| | Totals | 21,994,000 | $896 | $15,381 | |

**FIGURES SHOW** how seven in-plant cooling towers paid for themselves in 19 months. They cool 22-million gallons of recirculated water per month.

**NO EYESTRAIN** for employees on close electrical work. High-level light eliminates glare, dark valleys.

# New Ease for Workers' Eyes

**Here's a lighting system that bans eyestrain on Sylvania's TV assembly line. It will do as much for your workers — and they're sure to thank you for it.**

**THREAD A NEEDLE** against bright sunlight? Try it some time. It's just about as tough—and tiring — as the job Sylvania's workers used to do all day long on the TV assembly line. But not now. Not since Sylvania designed a new luminaire and installed it above the line in the Batavia plant. To see how good it is, take a look at the photo above.

**Here Was the Trouble**—Assemblers had to work close against a bright, cadmium-plated chassis — a reflective surface almost like a mirror. From overhead, open, unshielded luminaires cast a band of reflected brightness across the chassis. And when the chassis was tilted toward the worker to make work easier, it reflected a diffused image of the overhead light source. Thus a wired connection against the bright band appeared in silhouette. Against a darker background, direct lighting illuminated it. Working in these extremes of light and shadow, assemblers had to find a small hole and thread a fine wire through it — guide the point of a soldering iron — take care not to set up short circuits and grounds.

There was no way to avoid the reflection in the chassis. The problem was to spread the reflection and minimize the brightness, yet provide high-level illumination throughout the assembly area.

**This Solved the Problem**—Sylvania installed new luminaires. The system consists of two continuous rows of dual 90-watt open-end industrial units mounted side by side. They're shielded by an unbroken row of 32-in. square sections of white diffusing corrugated vinyl plastic. Corrugations are designed for uniform brightness. For lamp maintenance, any module section can be lifted and slid over an adjacent section. For cleaning, panels can be removed easily. The shielding is mounted about 2 inches below reflectors and 54 inches above the center of the chassis on the assembly line.

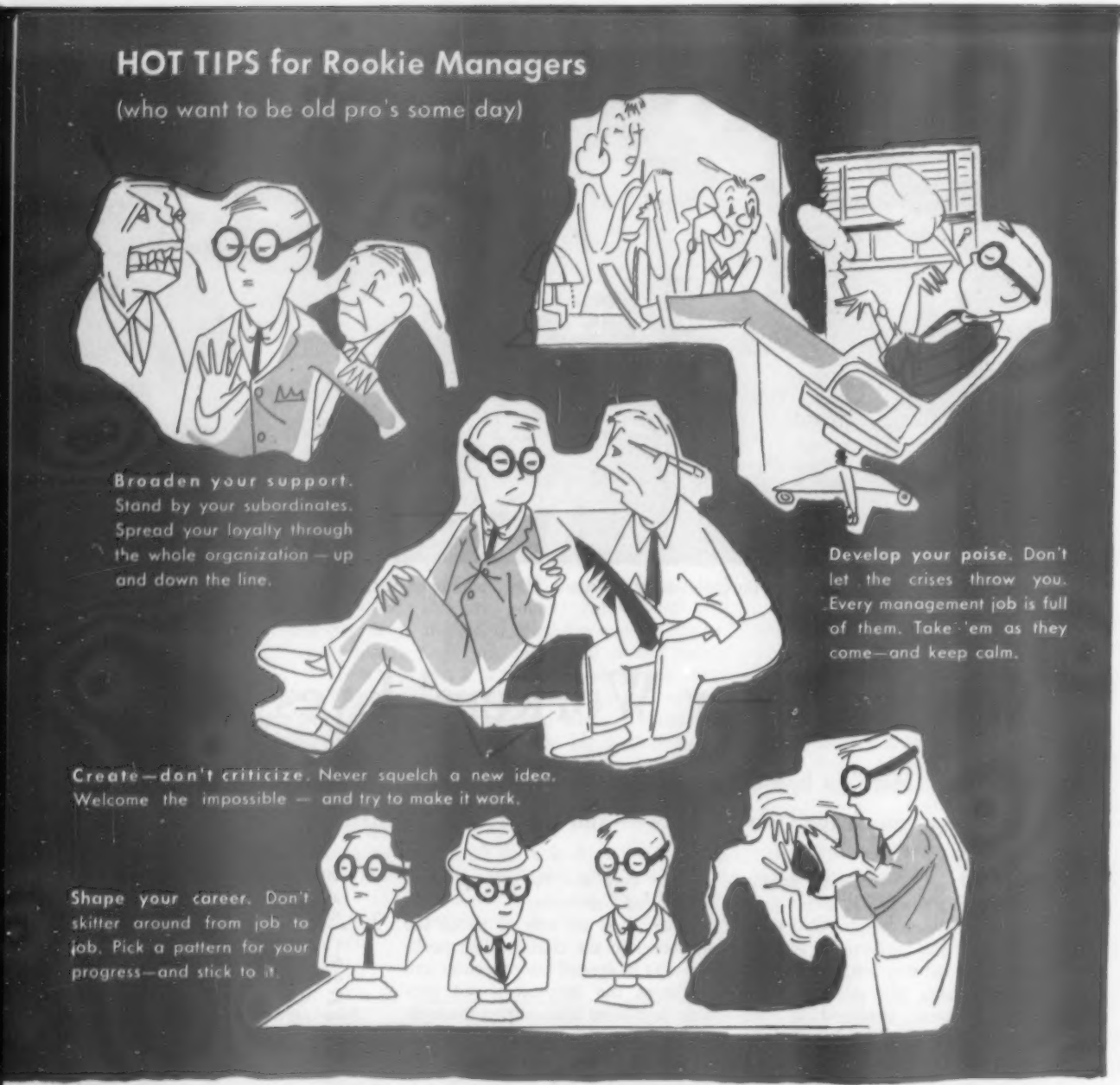
**These Are the Benefits**—Look at the table that follows. It shows how well Sylvania solved its lighting problem.

**Why Lighting Is Better Now**

| Test Spots | Illumination Old | New |
|---|---|---|
| Foot-candles at chassis: | | |
| A. Horizontal | 36 | 240 |
| B. Vertical | 5.5 | 74 |
| C. At tilted angle | 30 | 228 |
| Foot-Lamberts at chassis: | | |
| D. Brightest reflection | 200 | 195 |
| E. Darkest area | 10 | 55 |
| Ratios | | |
| A to B | 6.5:1 | 3.3:1 |
| D to C | 6.7:1 | 0.9:1 |
| D to E | 20:1 | 3.6:1 |

The new system not only provides a higher level of illumination. It also — as the ratios show — levels out the blinding differences between lighter and darker areas. Look, for example, at the D to E ratio. It means that a worker's eye now has to adapt itself to only a narrow range of brightness as it glances from one part to another.

To provide a comfortable visual environment, Sylvania has also installed unbroken rows of louvered luminaires over the general assembly area to supplement assembly-line lighting. Thus the upper part of the room is well illuminated.


HOT TIPS for Rookie Managers
(who want to be old pro's some day)
Broaden your support. Stand by your subordinates. Spread your loyalty through the whole organization — up and down the line.
Develop your poise. Don't let the crises throw you. Every management job is full of them. Take 'em as they come—and keep calm.
Create—don't criticize. Never squelch a new idea. Welcome the impossible — and try to make it work.
Shape your career. Don't skitter around from job to job. Pick a pattern for your progress—and stick to it.

# How Savvy Managers Get That Way

**For the rookie manager who wants to be an old pro some day—and for every other manager with his eye on the top spot—here's what it really takes to grow up.**

**WANT TO BECOME** a rugged plant operating guy? Really mature? Unruffled by crises?

If you can become that kind of manager, you'll be a marked man, for the simple reason that the breed is almost extinct these days. Why? Because the last 10 years have been pretty soft. Not many challenges. Not many knotty problems. Not much chance to pick up the knack of managing crises, keeping the lid on costs while production plummets, riding out upheavals in the shop.

Fact is, for the kind of experience that makes a man mature fast, you'd have to go back to the depression of the 30's. Things then were

By PAUL M. STOKES, Management Consultant, Larchmont, N. Y.

Keep on learning. Don't act like a hot-shot know-it-all. Face it: there's always more for you to learn.
Accept responsibility. No buck-passing for the young manager on the make. He reaches out for more responsibilities.
Seek causes, not symptoms. Don't panic when little troubles boil over. Diagnose them for the basic cause. Then move in.

really tough. It was an exacting school. And for developing management savvy, it outstripped all the fancy training programs ever dreamed up since.

But lots of today's young plant operating men have missed out on the school of hard knocks. Closest they ever came to a hard test of management qualities was late in 1953 and early in 1954. Business then dipped a little and—for a while—it looked like trouble ahead. But the slide didn't last long, didn't go deep. It was just enough to show up a flock of weaknesses among younger plant men — weaknesses that would be fatal in a serious downturn. Fatal to the men themselves, and to the plants they run.

Lacking a school of hard knocks to enroll in today, how can you grow into the kind of plant executive you and your company would like you to be? That is, a smooth manager in easy times like these, and a rock of strength when — and if — the going gets tough.

Well, best thing to do is to set up some benchmarks of management maturity for yourself. Measure yourself by them. And then strive to go beyond them. Here are a few suggested benchmarks:

**Broaden Your Support**—People used to call it loyalty. Now they call it support. But whatever you call it, it's the first sign of natural leadership and an essential in successful management.

You'll have to give as much as you expect to get—sometimes more. For instance, you want the support of your boss even when you're wrong. In fact, you can't do an effective job without this kind of help. So don't pull the rug out from under a subordinate when he makes a mistake. If you do, you can't hope for his support when you need it. And don't take the view that's common in some companies—the view that calls a subordinate disloyal when he doesn't back up his boss, but explains away the boss's lack of support by calling it a change in policy.

You may lean toward giving all your support to one superior. But remember, oldtimers are careful to spread their support around the organization. If a general housecleaning comes along, they don't want to be like the baby that was thrown out with the wash.

Yet it's not wise to be a meddler. A meddler can make bedlam out of the natural (and otherwise inconsequential) conflicts that exist in the plant. For instance, there's always some chafing between production and sales because of delivery schedules. And between engineering and operating because specifications are unrealistic for everyday manufacturing. And between production and finance because records have to be kept. What kind of leader lasts in this situation? It's the one who doesn't stir up a smoke screen of organizational tensions to cover his own operations. He puts his effort into keeping his eye on the main ball—that is, the over-all welfare of the organization.

**Create—Don't Criticize**—Being "agin" things comes naturally to the immature manager. For him, it's easy to pull any idea to shreds—especially if he speaks from theory rather than horse sense.

Take it this way: Only a few years ago engineers could prove that a bumblebee couldn't fly, atomic energy couldn't be harnessed, planes couldn't pierce the sound barrier, pushbutton warfare was strictly for

the science fiction birds. And while the idea-squelchers kept the air full of criticisms, bumblebees kept on flying, the A-bomb grew into an H-bomb, planes burst through the sound barrier, guided missiles flashed across the sky. The secret of these conquests lay not in books —but in the minds of men who tackled problems affirmatively.

So turn your criticisms into positive appraisals. And direct your suggestions toward making plans and ideas work. Do that, and you're on your way up. As one plant manager used to say about his young engineers: "I need men who can tell me how to do things—not why I can't do them."

**Shape Your Career Pattern**—First taste of success on the job sometimes sets a man's ambition off on a rampage. But the cold fact is that promotions are based on real self-improvement and usually come only with time and seasoning. Analyze the careers of successful executives. You'll find blocks of experience—two, three, or four years in one job or a series of related jobs. Yet many men make the mistake of flitting from company to company. Instead of speeding up their getting-ahead process, they usually slow themselves down.

So pick a pattern for the development of your career. And stick to it.

**Train Your Subordinates**—Want to embarrass an executive who hasn't yet "arrived"? Ask him about plans for developing subordinates.

The man who's moving ahead shows self-confidence about his position by giving others a chance to show their mettle. You'll find every working day filled with opportunities to test and train your subordinates on actual job assignments. Take these opportunities. Sometimes it's hard to grasp the fact that top executives give top rating to the young executives who deliberately manage to "let George do it."

**Develop Your Poise**—Even when things are going to hell in a handbasket, watch how the seasoned manager appears cool and collected. But for the immature manager, every day can become a series of crash programs. Don't waste your time blowing your valves. Accept the fact that crises are always bursting in on business. Use your time for study and analysis.

Try to act like the seasoned manager. He smiles when things get tough, thinks when problems get mountainous, accepts an occasional defeat as part of a game he's paid for playing. He doesn't get his exercise by jumping at conclusions. Ask him how he's been able to survive 25 years of heavy production schedules, nagging labor problems, and supervision that begets ulcers. He'll answer: "If you can't stand the heat, get out of the kitchen."

**Keep on Learning**—It's not unusual for a young hot-shot two years out of college to claim he only lacks a few things before he can feel he knows everything. If he still feels that way at 30, he's destined for a stunted career. Whatever a man's knowledge and ability, it's never too early to learn humility and open-mindedness.

As you move up the ladder, management jobs get so big that few people can master the total assignment. Be like the capable men you know—keep wishing for more insight, better judgment, and greater skill in solving the problems that don't have answers in the back of the book.

**Be Predictable**—People want to know where they stand with the boss —today and tomorrow. When you step into a new job, the rumor will start to grind out gossip about you. Big question: "What line will he take? Will he stick to it?"

You might borrow a page from the books on child psychology. The experts have studied the frustrations and maladjustments of kids. They suggest one good rule for handling them: Be consistent. Praise a child for an act today and bawl him out for the same act tomorrow—bingo, tears. If he tries to help with the dishes, breaks one, and gets a scolding—watch for a tantrum. If you embarrass him in front of others, look out—he may paint the cat green just to make it look ridiculous, too.

Same thing for adults. Don't upset them by following your whims of the moment. Don't let opportunism be your guide. Act so your people can be confident of your stability in making decisions. That way, you can tap their productive efforts successfully.

**Accept Responsibility** — Everything adds up to this: you either accept responsibility — or pass the buck. Many businesses suffer from problems that result when the ball gets dropped between executives. They'd be better off if executives worried less about the letter of responsibility, more about the job before and after it passes their desks.

**Be a Professional**—You've heard about the doctor who never cracks a book after he leaves medical school. Never reads medical journals — just scatters them across the waiting-room table to impress his patients. It isn't long before he's far behind. Then patients begin to lose faith in his skill and judgment.

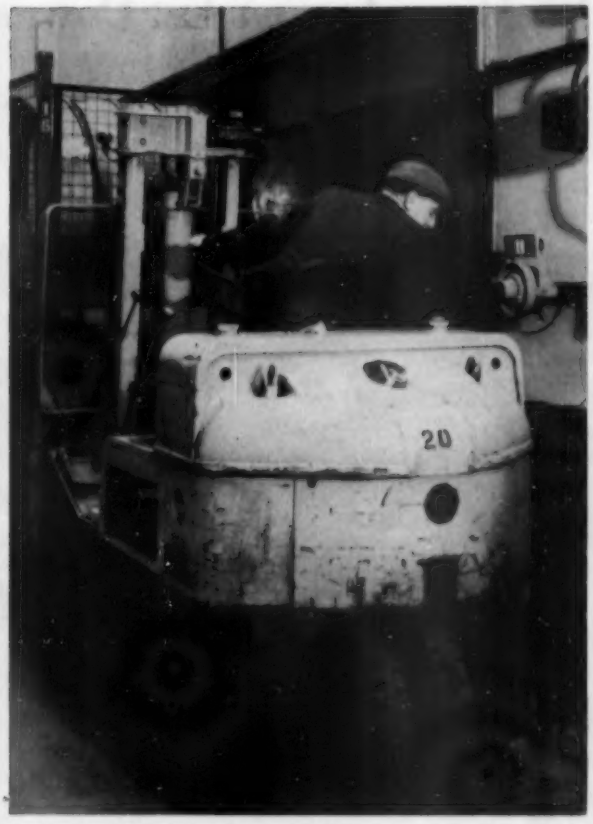
Same for you. All your business life, you've got to keep on learning how to be a manager. For example, joining a professional society and attending seminars and conferences is a good policy—even if you have to pay your own expenses. Taking part in these activities exposes you to new ideas, new influences, and personal relationships that boost your management potential. Also gives you a chance to seek advice from men whose problem-solving approach may be different from yours.

So look at your job as a profession. You'll begin to stand out as an effective guy in management — a business doctor who diagnoses problems, prescribes real cures.

**Seek Causes, Not Symptoms** — Real pro's in the management profession know that many a messy situation is only a symptom of something basic that's out of kilter. For the young manager, the key to effective action is self-discipline—that is, restraining himself from hasty action, and waiting until he's put his finger on the controlling cause.

An old pro once put it pretty well. He said: "You can be too eager. Symptoms of real trouble often look crucial themselves. Takes patience, restraint, probing to find underlying causes. But once you've found them, you can strike at the heart. You'll always be a kid in short pants unless you learn to hold off when everybody is pressuring you for immediate results."

**TRAFFIC CONTROLLER,** from lights on chart overhead, knows location of idle trucks and waiting loads.




**DRIVER RECEIVES INSTRUCTIONS** from dispatcher over intercom system. Driver needn't dismount to hear, or to call in.

# Intercom Triples Truck Use

**That's the pay-off for Bristol Aeroplane from its simple loudspeaker dispatching system. Cost: about the same as one additional fork-lift truck.**

**HOW TO CONTROL** the movement of fork trucks to keep them busy? That's a problem at a lot of plants. The Rodney Works of The Bristol Aeroplane Company Limited (Bristol, Eng.) has it licked, though. Its solution: A simple, low-cost loudspeaker dispatching system that can be operated by one man.

Before the installation was made, fork trucks had to return to a central control point between deliveries. By eliminating this dead time, the new system has tripled truck utilization. And, as mentioned above, it cost about as much as one fork-lift truck.

**How the system works.** The transport controller sits in a central control room, with a chart of the factory in front of him (left photo). There are 30 "waiting stations" in the plant, each indicated on the chart by two lights. When a trucker calls in from a station, indicating that he is free, the controller switches on the red light for that position. When a department supervisor calls in, indicating that he has a load to be transported, the green light marking its position is switched on. And, of course, the controller "teams up" idle trucks and waiting loads as quickly as possible. When a truck is dispatched to pick up a load, both lights involved are switched off.

If the control chart shows no free trucks at the waiting stations, the controller can alert drivers to waiting loads by transmitting a warning call signal. This signal can be transmitted to individual waiting points or, by using a master key switch, to all stations on the system.

Messages are transmitted and received in the shop by combination microphone-speaker units at each waiting point. The units have a maximum carrying distance of 30 feet, making it unnecessary for drivers to dismount from their trucks to either receive or send messages (right photo).

Bristol's system was developed by the company's materials handling and electrical engineering departments, installed by Tannoy, British sound engineers.

# No More August Let-Downs Here

**Instead, production got a big boost when an air conditioning system poured coolth into work areas.**

**PRODUCTION UP 29%** in nylon hose seaming department after Tennessee plant installed an air conditioning system. (It nearly doubled the first day.)

**MAINTENANCE DOWN 80%** because knitting machines need less care in controlled room temperature. An annual cleaning instead of two yearly is now enough.

**AIR CONDITIONING** peps up workers and machines. That's the experience of John Hardy & Son, Inc. (Pulaski, Tenn.), makers of full-fashioned nylon hosiery.

**Here are the facts,** based on nearly two summers' operation: Hardy installed its air conditioning system in the late summer of 1953. On the Monday before the system was put into operation, girls in the seaming department turned out 225 dozen pairs of hose. *One week later, with the system just started, they seamed 444 dozen pairs. Same girls, same hours, same machines, only a better climate. Output was upped nearly 100% that day just out of sheer exuberance.*

**Long-term, the seaming department has averaged a 29% increase.** Which means shorter workdays, no Saturday or other overtime work. Yet earnings stay up. Girls on piecework have increased productivity by one-third more.

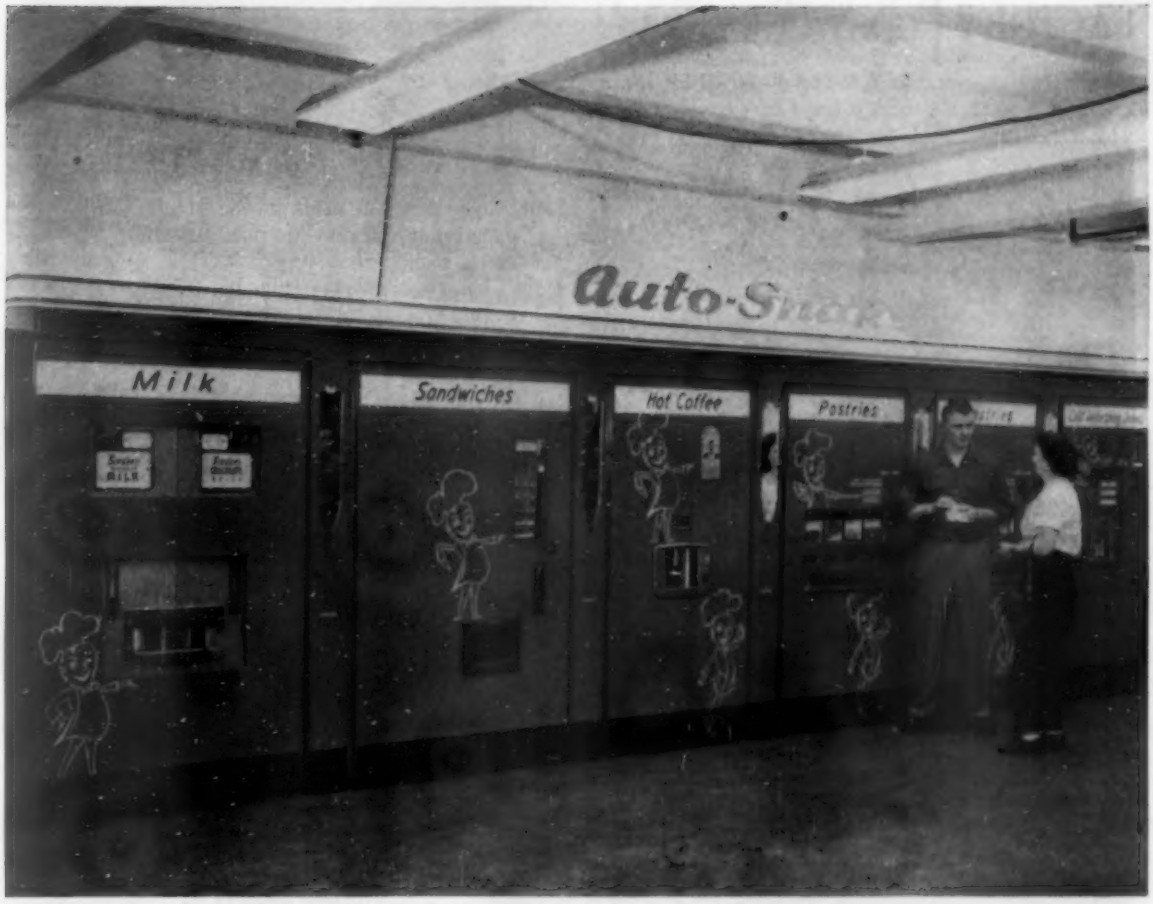
**Machine maintenance** costs got a real haircut, too. They have dropped about 80%. For several reasons:

Knitting machines are 57 feet long. Needles have only two-thousandths of an inch clearance. Expansion or contraction of these long machines from a variation of only a few degrees in temperature or humidity will cause jamming. Prior to air conditioning, a maintenance man was kept busy full-time on all shifts adjusting the machines. Now it's only a minor chore.

**Another saving** in maintenance labor has come out of less frequent cleaning of the knitting machines. Because the conditioned air is filtered on the way in, an annual cleaning—instead of twice a year as formerly—is enough.

The air conditioning system at Hardy consists of four Chrysler Airtemp 15-ton packaged water-cooled units tied into two duct systems. These ducts run the entire length of the factory.

**Same ductwork is used for heat.** Two units—one on each duct system—are controlled by both a thermostat and a humidistat for removal of moisture in other seasons. Temperature is then controlled by reheat. In winter a spray-type humidifier and atomizing nozzles add moisture. Thus temperature and humidity are kept on the nose all year around.




**HELP-YOURSELF MACHINES** sell over 12,000 items a day in this plant. Eleven standard machines are grouped together in a battery to localize the sales area. Workers can select items to satisfy their hunger—helps solve the plant's feeding problem.

# Snack Bar Runs Itself

**Newest twist in in-plant feeding is to rack up a battery of vending machines, let employees serve themselves. Here's your answer to the snack problem—maybe to all your employee-feeding headaches.**

**JUST NAME** your in-plant feeding problem: Hungry second and third shifts? No specialist to supervise your kitchen? Work force too small for restaurant operation? This automatic snack bar may be your answer, may provide your plant with the flexibility it needs.

The Auto-Snak in the picture above is one of eight batteries of automatic vending machines installed at the Moraine Products Division of General Motors Corporation, Dayton. Each battery consists of 11 standard-model machines enclosed in a steel-panel unit and illuminated by fluorescent lighting from under the valance. The Auto-Snaks attract more customers than the two plant stores they replaced.

Actually, Moraine's 3900 employees do their serious eating in two modern cafeterias run by the company. But each day they buy over 12,000 items—from sandwiches to cigars—from the machines. Workers like the self service. It saves time all around.

Moraine has 19 candy machines, 14 for pastry, 12 for cigarettes, 9 each for coffee and soda, 7 for milk, 6 each for sandwiches, ice cream, and cigars. A concessionaire owns and operates them.

Machines for thick soups and hot dishes are now in the pilot stage, soon may be commercially available for complete in-plant feeding. In fact, Eli Lilly in Indianapolis, Budd in Detroit, and RCA in Bloomington, Ind., already have begun to move in that direction.

# FACTORY | COST-CUTTERS

By WALTER F. WAGNER JR., Associate Editor, FACTORY

## New Way to Take Out the Dents

Straightening out dents in wing tanks was a costly headache at Martin Aircraft, Baltimore. Until recently, sections had to be cut from the tank so a worker could reach inside, pop dents out. But the vacuum system shown here now does the job quickly and easily, entirely from the outside. A plate, formed to the contour of the tank, is placed over the dent, sealed with a sponge rubber gasket. Connections are made to a two-stage vacuum pump, vacuum is applied, and dents—plus deformed stiffeners underneath—are straightened in a flash.

## Need Tape? Just Dial It

That's how the job is done at Brammer Manufacturing Company, Davenport, Iowa. Operator uses an electric "Dial-Taper" (product of Marsh Stencil Machine Company, Belleville, Ill.). Result: Less waste of tape, a marked speed-up of operations.

Here's how unit works. The operator estimates length of tape she needs. Then feeds this information to the machine via the face dial. The 13-position dial provides strips from 3 to 39 inches, in 3-in. increments. For a longer piece—say 54 inches—operator would dial 39, then 15, in quick succession. Strip emerges from front of machine, just under operator's hand.

The Brammer people, makers of wooden kitchen cabinets, saved about $200 the first year the machine was in use. This more than covered the machine's initial cost of $178.

## Chip Salvage Saves $5000 a Year

Tumbling-barrel chips cost money. And scrapping them, just because they were fouled with sludge after use, seemed like an avoidable waste to engineers at Thompson Products' Tapco Division, Euclid, Ohio. So they cooked up the vibrating screen system shown here, which salvages 2000 pounds of chips per month, is expected to save Tapco a well-worth-the-trouble $5000 per year.

The tumbling operator loads the screen in his idle time, scooping chips out of the sump of his machine with a bucket or shovel. The hose washes the sludge off the chips, down through the screen, and back into the sump. Vibrating action moves newly cleaned chips to end of screen, where they drop into the container in the foreground, ready for re-use.

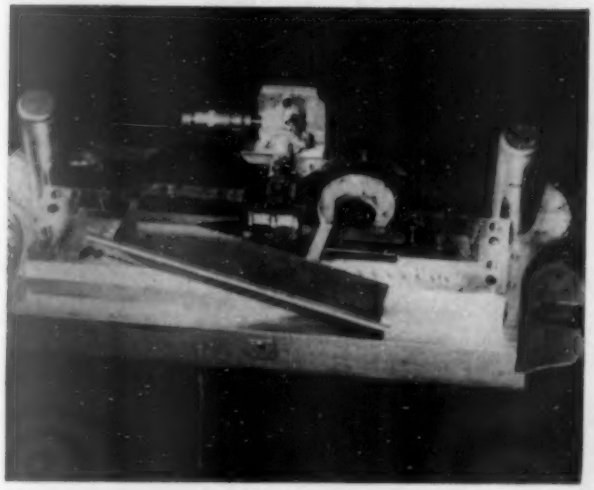
System is modification of an earlier idea that won a suggestion award for the tumbling operator.

## One Cart—Three Jobs

The unit shown here is a cart, of course. But it's also a ladder and a portable conveyor.

Need for the unit arose from a storage problem. Parker Appliance Company (Cleveland) needed more storage, decided to add two shelves on top of five-shelf racks in a finished-goods storage room. Only rub: Handlers wouldn't be able to reach the shelves without a ladder. So company engineers designed this combination ladder and stock-handling cart. As an extra, the cart was given a roller-conveyor top so that loaded pans can merely be rolled off onto the fixed conveyor that connects the storage area with the production floor.

The cart accommodates a standard handling pan, has folding steps, order holder on side, and removable stops to hold pans in place. Units, made of standard components, cost $125 apiece.



## Magnets Are Better Than Fingers

At least they do a more accurate job of positioning parts in dies at Hart & Cooley Manufacturing Company, Holland, Mich. The company, which manufactures air-handling registers, grills, and diffusers, uses a piercing press to punch holes in frame sections of the product. Formerly, fast-working operators sometimes failed to align the part properly. Result: a scrapped piece. Company engineers, working with Carboloy Department of General Electric Company (Detroit), redesigned the press die to hold two permanent magnets, each with a rated pull of 25 pounds. Both are insulated from die, except for their ends, by fiber material (magnet at right is uncovered in photo). Now operator simply positions part against a stop at the left end of the die. Magnets snap parts into die in perfect alignment.

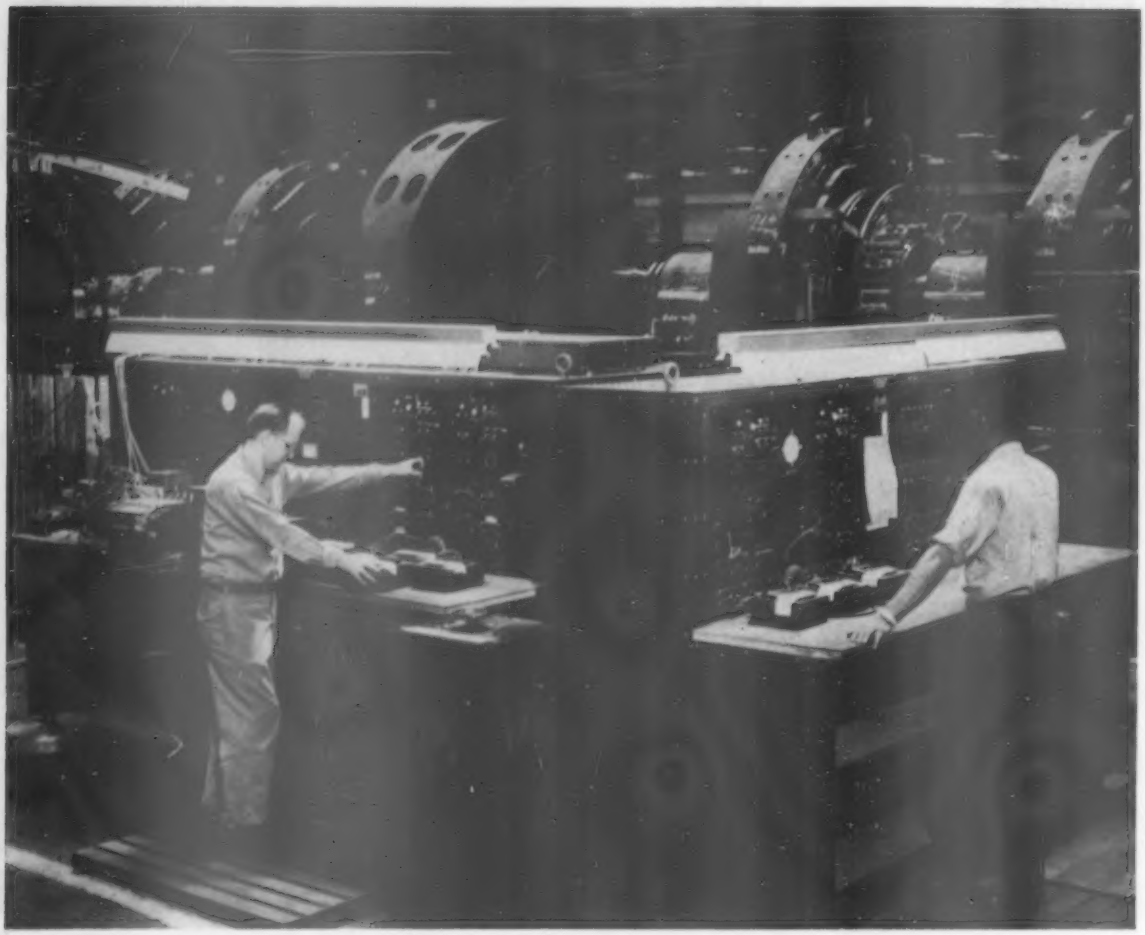
## Clean Cores Three Times as Fast

That's the boost in production rate that this mechanized core-cleaner has scored. And it has sharply reduced breakage of fragile cores during cleaning. Its cost: only $1100. Unit is in use at National-United States Radiator Corporation's plant at Edwardsville, Ill.

The unit consists of a portable 10-ft. belt conveyor, equipped with a series of steel brushes that rotate over the belt (inside the enclosure). Brushes neatly clean light flash and fins from the baked radiator and tube cores. Separate 1/3-hp. motors drive the conveyor and brushes.

Cleaning is a two-man operation. One man (at left) places rough cores on the belt. The other takes cleaned cores from the belt and stacks them. Before this operation was mechanized, cores were hand-cleaned with files. And breakage was high.

By W. A. STANBURY JR., Associate Editor, FACTORY



**INSTRUMENT MAZE** reveals facts about 11,000-kw. m-g set under test.

# Tough Test for Big Electrical Units

**Now — with its new $1-million test center completed at Schenectady, G-E tests heavy rotating equipment before shipping it to installation site.**

Tougher than field operating conditions—that's the kind of test General Electric now gives to large rotating electrical equipment in a new $1-million center at Schenectady (photo above). Tests it before delivering it to customers, too.

Tests what? Synchronous condensers up to 70,000 kva. Big hydrogenerators. Big d-c motors and generators. Big a-c synchronous and induction motors and generators. G-E erects them in an assembly area, brings power from the testroom, runs tests, knocks them down, then ships them to destination.

Heart of the testroom is a 70,000-kva. synchronous generator driven by a variable-speed d-c motor providing current of variable frequency. Also in the room are an m-g set to provide d-c current, exciter sets, elaborate switchgear. Current at zero power factor lagging (with voltage and current 90 degrees out of phase) can be provided for the largest rotating units G-E makes. Instrument stands alone take up 1425 square feet of space in the room.

## Coming: World's Biggest Showcase

Nothing little about this dream. It may be the world's biggest building —7-million square feet, 150-million cubic feet. Webb & Knapp, New York realtors, and the Pennsylvania Railroad have just agreed on option terms whereby the realty firm may erect it right above Penn Station.

Hooker for FACTORY readers: The huge building will be an international merchandise mart designed to house permanent industrial exhibits of goods, products, services and resources by private concerns and foreign governments.

**Name**—Palace of Progress.

**Cost**—Over $100-million.

**Audience**—The 110-million people who pass through Penn Station every year, plus 15-million in the metropolitan area, plus another 15-million within a 100-mile radius.

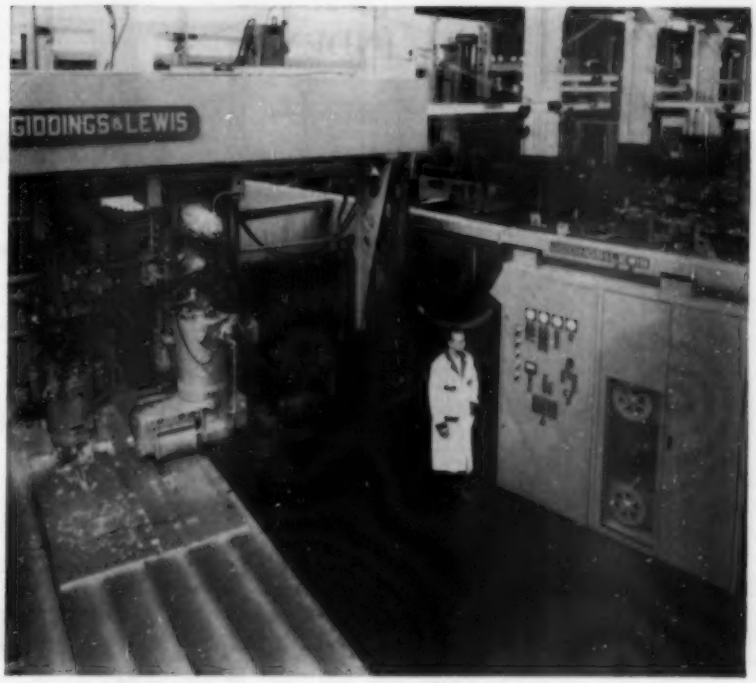
**Special features**—On the first floor, a single exhibit area six times as big as Madison Square Garden's arena. Six or seven exhibit floors higher up. Small industrial theaters equipped with television and motion-picture facilities. Elevators for lifting and lowering products as big as a diesel locomotive from floor to floor.

**Completion date**—Spring, 1958 (if the few remaining obstacles can be cleared).

## New Worker Label– "Automation Tender"

Know what it is? Ask UAW-CIO's National Ford Department, UAW Local 420, and Ford's Cleveland Stamping Plant. They'll tell you it's a new worker classification agreed upon shortly before the recent UAW-Ford settlement at the end of May. The June issue of *Ammunition*, UAW's monthly magazine, says this is "the first time automation's startling industrial and occupational changes have been recognized in a union-company contract." The new label covers about one-third of the 2600-member bargaining unit.

Wage rate? Before the recent wage agreement, hourly rate for an automation tender was $2.04½. Now it's $2.16½.




**MILLING MACHINE** takes orders from automatically prepared tape.

## New Step in Automation

**Now you can make magnetic tape directly from numerical data to run your biggest, most complex machines.**

Magnetic tape to control intricate machines? Sure. But go one step further. Now, with electronics, you can transfer numerical data directly to magnetic tape without translating into a binary code. Result: An automation system that combines—for the first time—an electronic "brain" and a magnetic "memory" for production of duplicate precision parts from blueprint dimensions.

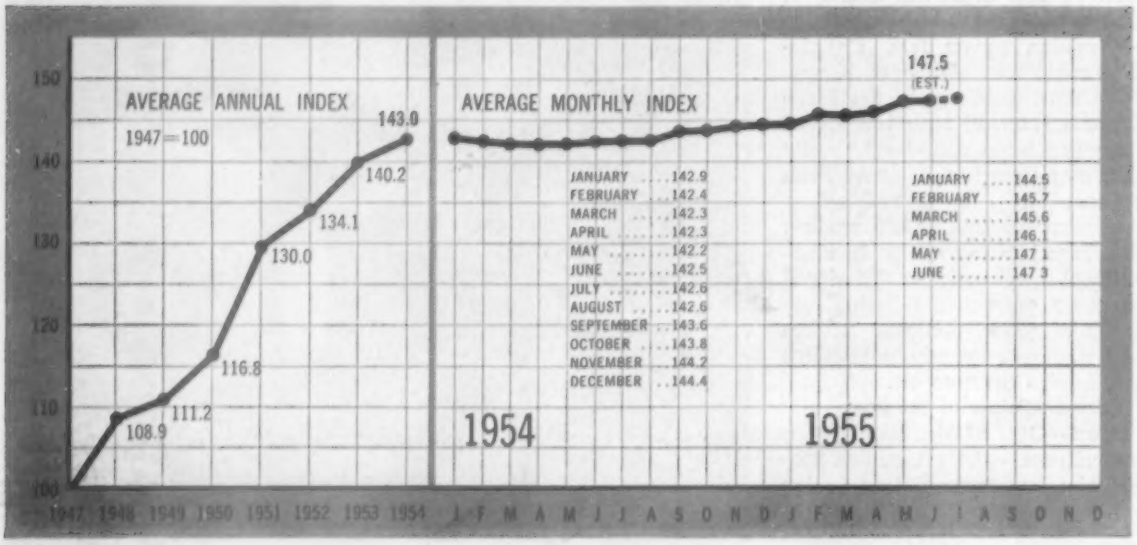
It's called the Numericord system. It was developed at M.I.T. after three years of research sponsored by Giddings & Lewis Machine Tool Company, Fond du Lac, Wis., together with allied research conducted by General Electric. Is now commercially available.

What'll it do? Look at the picture up above. There, under Numericord control, a G. & L. spar and skin milling machine is performing all plunge, channel, pocket, and contouring cuts in milling jetplane skin and wing panels from solid 75 ST aluminum plate. The system has reduced or eliminated tool setting, gaging, template changes, and positioning; banned losses from wasted motion, lack of skill, and miscalculations; saved at least 50% in machining time when compared with manual operation.

With Numericord you can plan and engineer (by mathematical computation) machining cycles involving up to 5 machine axes and 22 auxiliary functions. Pre-calculated data are processed by the electronic-brain computing director into continuous phase-modulated command signals, automatically recorded on tape. This magnetic-memory tape is read in the machine control unit to operate servo-mechanisms that do all feed and transverse jobs.

What's more, you can include audio signals in the tape. That way, you can alert the machine attendant to up-coming tool changes and inspection periods.

# FACTORY | COST INDEX




## Steel Wages Jump Again...

**... and so, for sure, will factory costs.**

**But how much, is the $64,000 question.**

**WAGE GAINS** achieved by the steel workers will have an inflationary effect on steel prices. And these gains will be reflected over the months ahead in higher prices for materials and equipment appearing in FACTORY's Cost Index.

There are, however, widely conflicting opinions on the full price impact of the steel contract. The industry may absorb some of the wage increase by profits, which are very substantial this year. Also the demand for steel may taper off in the fall—which should have a moderating effect on prices. This slowdown is expected because auto production may level off. And because some part of the demand early this year may have gone into inventories in anticipation of price increases.

* * *

FACTORY's "Cost Index of Plant Maintenance" keeps you informed of monthly changes in cost of 1) upkeep, repair, and replacement of plant buildings and facilities; 2) upkeep and repair of operating equipment. Source of all figures: *U. S. Bureau of Labor Statistics.*

For complete information—including cost indexes for the 6-year period 1948-1953, and "10 Ways to Use the Cost Index"—send for a 16-page reprint of "FACTORY's Cost Index" (originally published in January 1954). Price 50¢. Address Editor, FACTORY, 330 W. 42nd St., New York 36.

| | AVERAGE 1954 | PREVIOUS MONTH (Revised) | LATEST MONTH (June) |
|---|---|---|---|
| **Building and Facilities Index** | **139.6** | **142.0** | **142.1** |
| **Materials** | 125.7 | 128.6 | 128.8 |
| Brick | 132.6 | 135.9 | 136.3 |
| Elec. fixtures | 115.1 | 120.5 | 120.5 |
| Elec. switches, boards, fuses | 141.9 | 142.4 | 142.4 |
| Elec. wire, copper | 130.3 | 152.4 | 152.4 |
| Glass | 137.3 | 141.3 | 141.3 |
| Gutters, spouts, ducts | 144.5 | 146.9 | 146.9 |
| Gypsum products | 129.2 | 129.2 | 129.2 |
| Heating equipment | 120.0 | 119.1 | 119.1 |
| Lumber | 124.2 | 131.5 | 131.9 |
| Millwork | 149.6 | 148.2 | 147.0 |
| Paint | 114.4 | 116.4 | 116.4 |
| Pipe, cast iron | 140.9 | 140.9 | 140.9 |
| Pipe, steel | 148.0 | 152.2 | 152.2 |
| Pipe & tubing, copper | 142.7 | 156.0 | 156.0 |
| Roofing | 110.5 | 112.4 | 113.4 |
| Sanitary fixtures | 144.3 | 144.3 | 144.3 |
| Sash, metal frame trim | 134.1 | 138.0 | 138.0 |
| Solder | 115.8 | 115.9 | 119.0 |
| Steel, structural | 170.3 | 173.1 | 173.1 |
| Tanks, steel | 121.0 | 122.8 | 122.7 |
| Valves & fittings | 130.6 | 135.5 | 135.6 |
| Wire mesh | 155.7 | 155.2 | 155.2 |
| **Labor** | 148.8 | 150.9 | 150.9 |
| Carpenters | 143.4 | 144.0 | 144.0 |
| Electricians | 152.1 | 152.9 | 152.9 |
| Painters | 151.8 | 155.9 | 155.9 |
| **Equipment Index** | **144.5** | **148.3** | **149.5** |
| **Materials** | 136.7 | 141.1 | 141.8 |
| Abrasives | 129.7 | 130.0 | 130.0 |
| Alloys, non-ferrous | 117.6 | 133.5 | 133.4 |
| Bars & plate, steel | 177.8 | 180.7 | 180.7 |
| Bearings | 140.7 | 145.2 | 145.5 |
| Belting | 135.1 | 141.6 | 141.6 |
| Bolts, nuts & screws | 174.9 | 175.3 | 176.5 |
| Chain | 137.6 | 149.9 | 149.9 |
| Controls (electrical) | 141.9 | 142.4 | 142.4 |
| Gear-reduction units | 143.8 | 143.9 | 143.9 |
| Hand tools, mechanics | 157.8 | 161.2 | 161.2 |
| Lubricants | 63.9 | 64.5 | 64.5 |
| Motors | 124.7 | 122.1 | 122.1 |
| Non-ferrous metals | 121.3 | 134.8 | 134.8 |
| Precision tools | 126.9 | 137.5 | 137.6 |
| Pumps | 143.2 | 146.5 | 146.5 |
| Tools, cutting | 129.0 | 137.9 | 143.4 |
| Valves & fittings | 130.6 | 135.5 | 135.6 |
| **Labor** | 145.9 | 154.7 | 154.7 |
| All mfg. labor | 146.0 | 151.2 | 151.2 |
| Machine tool labor | 153.2 | 158.2 | 158.2 |
| **FACTORY's COST INDEX** | **143.0** | **147.1** | **147.3** |

*Get your free copy of this new booklet*

## INVENTORY CONTROL FOR MANUFACTURERS

*How It Balances Stocks And Reduces Costs*

THIS NEW comprehensive, illustrated booklet, "Inventory Control For Manufacturers," is filled with the most effective, modern techniques for balancing stocks and reducing costs.

Inventory represents about one-third of the capital invested in manufacturing and usually is the largest item on the balance sheet outside of plant and equipment. OVERSTOCKS result in increased investment, useless tying up of capital, increased insurance, the use of more floor space for storage purposes, deterioration and obsolescence, and other substantial losses. UNDERSTOCKS result in lost sales, extra expense of "rush" orders and last minute buying, and idle shop time waiting for short and undelivered material.

Don't miss this opportunity to get the full picture of what Inventory Control means to Management, Production, Purchasing and Sales. Upon inventory availability and adequacy depend scheduling, workflow and delivery – even such human factors as job stability and good labor relations. Inventory Control is the backbone of all manufacturing operations.

No two plants have the same problems but the principles of a good inventory control record as outlined in this booklet, may be profitably adapted and applied to the needs of any business.

Write today for this new booklet. Ask for KD406– "Inventory Control For Manufacturers . . . How It Balances Stocks and Reduces Costs." Remington Rand, Room 1822, 315 Fourth Avenue, New York 10.

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DIVISION OF SPERRY RAND CORPORATION

# FACTORY | MAINTENANCE TRENDS

By CARL G. WYDER, Maintenance Editor, FACTORY

**FIRE TEST** at Underwriters' Laboratories reveals . . .

## New Roof Makes Plants Fire-Safe

**Want a "sure-fire" anti-fire roof? Here's one that stands up under prolonged exposure to high temperatures.**

The hunk of roof-covering above is evidence of the fire-resistant qualities of a gypsum slab roof. It was carved out of the roof after some 82 minutes' exposure to an internal fire load meeting ASTM time-temperature requirements.

This test was made on June 8 at the UL testing station at Northbrook, Ill. Subject of the test was a 20x100-ft. unprotected steel frame structure. The roof deck was a monolithic poured-in-place gypsum roof slab. This slab consisted of 2 inches of gypsum concrete, reinforced with wire mesh, poured over ½-in. thick gypsum formboard resting on steel beams.

The gypsum slab was topped by a regular built-up roof. First came a vapor seal of built-up layers of asphalt-saturated felt separated by moppings of asphalt. There followed a ½-in. layer of insulation, several layers of tar-saturated felt with pitch mopping, and a tar and gravel-top surface.

When two gasoline jet burners were lit under the roof for the test, the interior temperature reached 1100 F. in 5 minutes, slowly climbed to 1550 F. in 30 minutes, and to almost 1600 F. in 52 minutes. After 10 minutes' cooling, a second try reached 1765 F. in 30 more minutes.

Although the steel beams over the flames were badly deflected, the monolithic roof remained intact. There was no break-through of fire. In fact, the bitumen vapor seal on this extracted specimen was still unharmed, and had become only slightly tacky.

## "A Good Maintenance Manager?"

This was the subject of a speech by Prof. J. Williamson, director of management service division, Temple University, at a recent maintenance conference in Philadelphia.

"He is very much like the conductor of an orchestra," said Williamson. "The conductor doesn't have to know how to play every instrument. But he must know music . . . how each instrument sounds . . . the part each musician must play . . . how to coordinate their efforts so that true harmony will result." Pretty cute analogy, eh?

But here's a piece of advice to chew on. "There's a tendency," said Williamson, "for supervisors to report to their desks first thing every morning. They stay there for several hours. They have to—there are so many types of reports to make out, and forms to fill, they are slaves to paperwork systems. I say to anyone who wants to be a good maintenance manager: Don't let a supervisor go near his desk the first hour of the day!"

## New Facts on Air Pollution

That's what's needed, you'll agree, after reading Dr. Falk's article, starting p. 97 of this issue.

Well, Pendray & Company, New York City, garnered some facts recently from a survey of 67 major industrial cities. Here's how they rated air-pollution problems in order of importance: 1) smoke, 2) airborne industrial wastes, 3) dust, 4) odors, and 5) others.

The survey also reported that public complaints about odors and fumes are on the rise, with industry getting most the blame. Also, industry isn't finding it easy or cheap to solve the odor problems.

Here's more food for thought. In a yes-or-no question, "Do you plan to intensify your enforcement efforts?" 62% said "Yes."

**Wherever throw-off, drip or squeeze-out is a problem...**

# USE SUNTAC OIL

**OIL LEAKAGE MEANS:**
higher lubrication costs
messy machines
hazardous oil slicks on the floor

**SUNTAC OIL:**
cuts leakage
lowers oil costs
minimizes hazardous floor conditions

**In addition** to its leak reducing properties, Suntac has all the high quality of expensive general-purpose oils. Suntac is fortified against oxidation to assure long oil life and against rust and corrosion to protect valuable machines. And, last but not least, because the leak-reducing agent is 100% petroleum, Suntac leaves no gummy film or residue.

For more information about Suntac, the oil especially made to prevent drip, throw-off and squeeze-out, see your Sun representative or write for your copy of Suntac Technical Bulletin to Sun Oil Company, Philadelphia 3, Pa. Dept. F-8.

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**INDUSTRIAL PRODUCTS DEPARTMENT**

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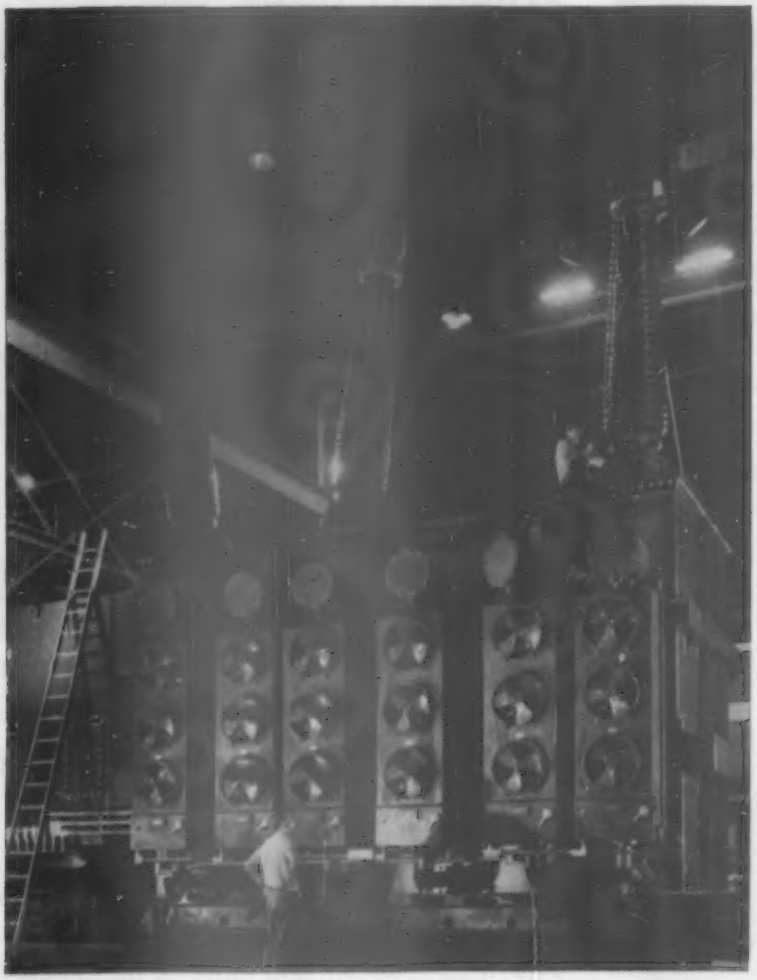
# FACTORY | ELECTRICAL TRENDS

By F. W. MICHAL, Electrical Editor, FACTORY



**FINISHING TOUCHES** are applied to 100,000-kva. transformer that's...

## As Big as They Come

**At least this transformer is the biggest ever to be shipped in a single, completely assembled tank.**

Remember when you received your first main transformer? Bet you thought it was big. Particularly when the crew jockeyed it around onto the foundation pad. But just take a gander at this huge baby (above). Built by General Electric Company, the 100,000-kva., 330,-000-volt unit is equipped with load-tap-changing mechanism and forced-oil-air cooling.

First of this rating ever to be shipped completely assembled, unit is one of several to be installed by the Atomic Energy Commission at the step-down end of the Ohio Valley Electric Company's 330-kv. transmission line.

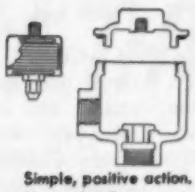
## Tighten Bushings by Hand?

You can, using a new Thomas & Betts bushing made from a special acetate butyrate formula that permits them to be threaded easily by hand. National Aniline Division, Allied Chemical & Dye Corporation, recently used them to solve a tough problem at its new office and lab building in Chesterfield County, Pa. Rigid 4-in. conduit had to be terminated inside a junction box entering from the sub-station outside. Cabinet partitions inside the box were only 10 inches apart, making it impossible to install insulating bushings with a wrench—which is, of course, normal practice. Yet the bushings were required by the National Electric Code to protect cable insulation from damage caused by sharp edges of conduit. The hand-applied bushings did the job. And the dual-purpose thread design is controlling loosening from vibration.

## Lubrication Costs— Down $60,000 per year

That's the sum engineers at McLouth Steel Corporation's hot strip mill in Trenton, Mich., say they'll save in lubrication costs alone. How? By switching to individual motors at each roll of front and rear mill tables, and the roughing mill and finishing mill approach tables. The 146 specially modified G-E d-c., adjustable-voltage, armored mill motors eliminate the need for main reduction and level gears on the tables and the attendant lubrication and maintenance costs. Even more important, say McLouth engineers, unscheduled downtime on the tables will be practically eliminated. Although slightly higher in first cost than the conventional drive, the new type of installation will pay for itself completely by the elimination of one unscheduled shutdown—and that's because one hour of downtime can result in the loss of $20,000 in saleable strip.

# Simplicity



Simple, positive action. Has only three parts —thermostatic bellows, body, cap. Won't leak!

Nicholson simplicity. Pays off big in any plant—in peak performance, easy maintenance. Simple in design, simple in operation, Nicholson Industrial Traps prove the most effective method for discharging condensate and air from steam lines.

- **Fast, intermittent valve action.**
- **Tight, positive shut-off.**
- **No dribbling. No waste of steam.**
- **Low operating cost. Low maintenance.**

Before you specify, check Nicholson. Write for *Catalog 953*.

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TRAPS • VALVES • FLOATS • METAL PARTITIONS

14 OREGON STREET, WILKES-BARRE, PA. • SALES AND ENGINEERING OFFICES IN 58 PRINCIPAL CITIES

# FACTORY | CATALOG NEWS

To get these catalogs, circle item numbers on the Reader Service Card next to back cover.

## PRODUCTION

**1—Machine Tool Replacement.** Information kit discusses why, with what, and how. Capital equipment analysis form helps you determine cost of operating your old equipment vs. new. Financing plans. 16 pages. Form 5422. *Jones & Lamson Machine Co.*

**2—Plastic Products.** This 48-pager covers a complete line of polyethylene and polyvinylchloride fabricated products, plates, sheets, rods, tubes, pipes and fittings, hot gas welding and spraying equipment. Charts of chemical resistance. *American Agile Corp.*

**3—Gears.** Available facilities for machining, fabricating, heat treating, and plating gears for precision and general applications are cataloged in this 24-pager. Lists machine tools used to mass-produce these items. *Foote Bros. Gear and Machine Corp.*

**4—Sprayed Metal Tooling.** Bulletin explains this process of making various-shaped molds that are inexpensive, light, portable, have high heat transmission. Offers services for producing vacuum-formed plastics from idea stage to production line. *Glidden Coating Co.*

**5—Abrasive Cutting Machines.** Bench type and floor models are described and illustrated in this bulletin. Includes data on length of cutting time for various shapes and types of materials, capacities, specifications, operating hints. *Beaver Pipe Tools, Inc.*

**6—Welding.** Publication list briefly describes over 100 available welding and cutting technical reprints, text books, safety booklets, slidefilms, and movies. Contains convenient order cards for requesting items of interest to reader. 16 pages. *Air Reduction Co.*

**7—Precision Tooling.** Spiral-bound, 38-page brochure offers custom-made lamination dies and stampings, tungsten-carbide fabrication, precision cutting tools and gages, jigs and fixtures, custom jig grinding and boring, special-purpose equipment. Illustrated. *Cleveland Form Tool and Die Co.*

**8—Metalizing Equipment.** Catalog 551 explains the high-vacuum process of metallic finishing. Illustrates mass production and experimental type of metalizing units. Offers equipment, parts, and service. 8 pages. *High Vacuum Equipment Corp.*

**9—Machine Tools.** More than 275 machines used in the metalworking, glass-making, and packaging industries are described and illustrated in this 40-page, spiral-bound, condensed catalog. Tells in detail what they can do and how they do it. *Emhart Mfg. Co.*

## PIPELINES & FITTINGS

**10—Stainless Steel Valves.** Technical data booklet covers their design, selection, maintenance, and repair. Photos, engineering drawings, and cutaways combine to make it a complete, yet condensed discussion of stainless valves. 12 pages. Catalog 55. *Cooper Alloy Corp.*

**11—Wrought Iron Pipe.** "True Piping Economy" compares wrought iron with other types in terms of cost, installation, and maintenance considerations. Lists uses in different types of service. Presents several case histories. 8 pages. *A. M. Byers Co.*

**12—Flexible Pipe Connections.** Catalog EZ-55 describes packless expansion joints for general and process piping that solves vibration and expansion control problems. Covers pressure and temperature ranges of application. 12 pages. *T. R. Finn & Co.*

**13—Solenoid Valves.** Bulletin covers units for use with liquids, gases, or refrigerants—for stopping and starting; mixing and blending; metering or measuring; controlling pressure differential, pressure, temperature, and flow. 6 pages. Form RS141. *A-P Controls Corp.*

**14—Centrifugal Pumps.** Bulletin 350-51 features single-stage, double-suction units with purge-type grease lubrication that increases bearing life. Two-page cutaway points out 18 features. 6 pages. *American-Marsh Pumps, Inc.*

**15—Bronze Globe Valve.** Here's the story on a new valve with a special alloy seat and disc that needs no maintenance, renewal, repair, or replacement. Circular 602 cites record of a 4-year testing program in various types of services. *Lunkenheimer Co.*

## POWER TRANSMISSION

**16—Gears.** 76 pages of illustrations, diagrams, definitions, tables, charts, and explanations regarding all types. Something you'll appreciate: Catalog G-655 presents a simplified method of calculating hp. ratings of all types of gearing. *Philadelphia Gear Works, Inc.*

**17—Speed Reducers.** Straight-line and right-angle units with capacities ranging from fractional hp. to 150 hp. are covered in Engineering

*Turn to page 228*


OTHER CATALOGS

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# TAPER-LOCK

A PATENTED PRODUCT OF DODGE

## —OFF THE SHELF

NO REBORING!
NO KEYSEATING!
NO MACHINING!

Ready for the shaft, with no costly, time-consuming operations to make them fit. That's the big news about Dodge Taper-Lock Sprockets. Taper-Lock grips the shaft with the firmness of a shrunk-on fit, yet comes off easily. Bushings may be re-used. They come in sizes to meet most every application.

Taper-Lock Sprockets are available from Distributors' stocks in a complete range of B-type steel sprockets—½" through 2" pitch. Dodge quality Roller Chain is packaged in 10-foot lengths—also available in 50-foot and 100-foot reels. Save time—save money—keep production rolling—get Dodge Taper-Lock Sprockets and Roller Chain from your Dodge Distributor.

**DODGE MANUFACTURING CORPORATION, 400 Union St., Mishawaka, Ind.**

**CALL THE TRANSMISSIONEER,** your local Dodge Distributor, for valuable assistance on new, cost-saving methods. Look for his name under "Power Transmission Machinery" in your classified telephone directory, or write us.

***THERE'S ONLY ONE TAPER-LOCK, THE BUSHING THAT MOUNTS FLUSH!***

Standardize; economize with Taper-Lock, the bushing that is interchangeable in Dodge sprockets, sheaves, couplings and conveyor pulleys. *More than 2,000,000 in use!*

**DODGE**

of Mishawaka, Ind.

# FACTORY | EQUIPMENT NEWS

For more about these products, circle item numbers on Reader Service Card next to back cover.

**ONE MAST** only is the unique feature of this lift truck. Two box-like sections telescope within each other. Mast is stronger, has more torsional rigidity, less deflection.

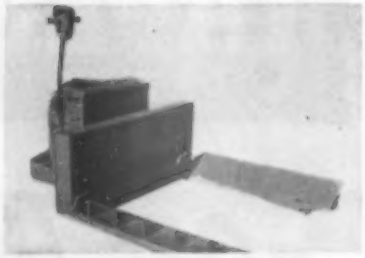
## Now You See Fork and Load

**See Better. Work faster. Work safer. With the "Monomast," handle more work per day with less fatigue.**

How? Clear, unobstructed view means more accurate load placing, safer load handling. Permits faster speed, faster maneuvering, faster approach. Hoist speed is 58 ft. per min. Takes all standard hydraulic and non-hydraulic attachments. Mounting is for maker's 3000- and 4000-lb. capacity trucks. Can be field-installed.

*Hyster Co.* (Circle No. 1, Reader Service Card.)

**2—Metal-Enclosed Switchgear** features breaker compartments isolated from bus, other breakers. Reversible panels permit closing doors with breakers in any position. Indoor or outdoor units to 600 volts a-c, 4000 amp., 100,000 aic. *Allis-Chalmers Mfg. Co.*



**3—Roll Handler** is a pallet type. Operator-led, electric-powered truck has heavy-duty forks that straddle cylindrical loads, lift them 4 in. 4000- and 6000-lb. capacity models with forks of various sizes. *Automatic Transportation Co.*

*Turn the page*

OTHER EQUIPMENT

Air Handling pages 140, 147, 190
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Safety & Plant Protection pages 161, 174, 188, 198, 200
Miscellaneous pages 147, 150, 168, 174, 186

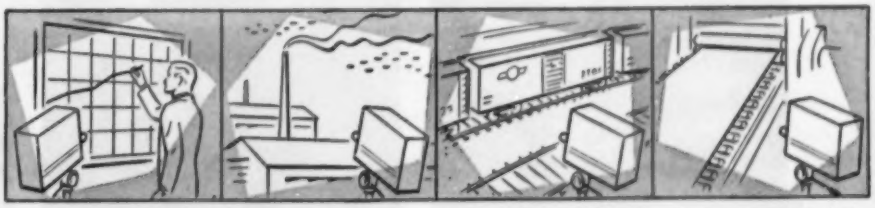
# PHILCO *Industrial TV*

## The Watchful Eye that *Never Sleeps!*

Now you can have 24-hour supervision of operations . . . perform a thousand and one tasks at a distance . . . in the next room . . . across town or many miles away. In steel, chemicals, railroads, scientific research . . . *in any industry* . . . Philco Industrial TV gives you a fast accurate picture of important operations . . .warns you of dangerous conditions . . . lets you direct progress just as though you were on the scene!

The amazingly compact Philco Industrial TV Camera fits in "out of the way" places . . . can be equipped for remote control of pan, tilt and lens adjustment. The super-sensitive camera easily picks up *all* the detail, even in dimly lighted areas and a powerful, high-definition monitor displays a crisp, clear picture in the room where *you* are. Here's complete control—*right now* saving industry thousands of dollars . . . precious hours . . . even priceless lives! Get complete data on the dependable Philco Industrial TV equipment. Write to Philco Dept. FM today.

Philco Large-Screen Professional TV Monitor and Control Units.



Instantly relays graphic information to vital points. Useful in factories, banks, retail establishments.

Warns of smoke violations. Affords constant protection of property in power plants and factories.

Keeps constant watch on cargo shipments night and day whether by rail, truck or air freight.

Scans production lines. Warns of mechanical failures. Ideal for steel, paper, auto manufacturers.

## PHILCO CORPORATION

GOVERNMENT AND INDUSTRIAL DIVISION • PHILADELPHIA 44, PENNSYLVANIA

In Canada: Philco Corporation of Canada Limited, Don Mills, Ontario

**WHEEL ADAPTS** to angular, curved, or flat surfaces with equal ease.

## Polishing Wheel Shapes to the Work

Secret of "Kon-toor": It's practically all-coated abrasive. You can shape to contour of work—actually polish two or three sides at the same time. Wheel holds shape for working life, even as it wears. Sheets themselves have grains on both sides. Unbroken abrasive contact provides smooth polishing action. Results in high polish. Runs cooler, consumes less power.

To polish simple, slight contours, wheel is used as delivered. For sharper angles or complex shapes, face is dressed to contour. For precise contours, profile gage is used. Designed for straight line and rotary automatic polishing equipment.

*Behr-Manning Corp.* (Circle No. 4, Reader Service Card.)

**5—Torque-Controlled Screwdrivers** and nut-runners eliminate human element. Clutch disengages instant proper torque is attained—and until tool is removed. 13 "Magnamatics"; reversible, non-reversible, #4—⅜-in. screw sizes. *Chicago Pneumatic Tool Co.*

**6—Welding Electrode,** contact-type, is made of powdered iron. Tractor manufacturer reports use of "Strikeasy 1" for fabricating bucket assemblies cut welding time in half. Says it's fast, practically self-cleaning, produces quality weld. *General Electric Co.*

**7—Custom-Built Transformers** answer need where standard units are inadequate or when manufacturers cannot economically produce special types in small numbers. Air-cooled transformers and autotransformers available, 5 va. to 500 kva. *Multi-Amp Corp.*

**8—Platform Truck** transports two skids at the same time. Fitted with two independently operated platforms which can be separated 62 in. Each platform handles 2000 lb. Upper platform has free lift of 35 in., maximum 69 in.; lower lifts 4½ in. *Yale & Towne Mfg. Co.*

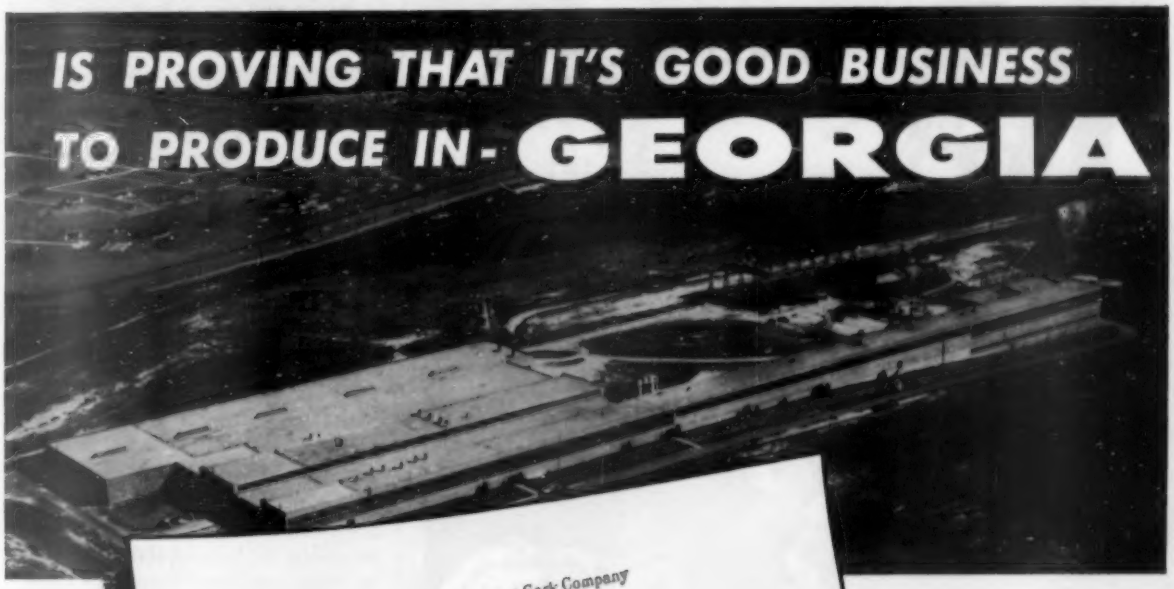
**9—Engine-Driven Welder** is for pipeline welding and all types of maintenance work. Range of Type WD20AG is 40-250 amp. Handles all d-c or a-c/d-c electrodes, 1/16-¼ in., with minimum load drop-off, fast response, high recovery voltage. *General Electric Co.*

**10—Telescoping Conveyor** consists of as many as four 5- or 10-ft. sections. Fourth unit is 3-ft., 8-in. high. Ideal for loading, unloading, warehousing. Five types of wheel conveyor, 10- or 16-in. wide. *Mathews Conveyor Co.*

*Turn the page*

# ARMSTRONG CORK COMPANY

## IS PROVING THAT IT'S GOOD BUSINESS TO PRODUCE IN - GEORGIA



Armstrong Cork Company
Lancaster, Pa.

March 25, 1955

C.J Backstrand
President

Dear Mr. Candler:

When we included in our post-war expansion program the establishment of a new plant to step up substantially our production of fiberboard building products, we surveyed many areas of the nation to determine the best location for the plant. These surveys showed that Georgia offered the maximum combination of economic advantages for the new factory — ample supplies of pulpwood, the basic raw material; electric power and natural gas at reasonable rates; excellent transportation facilities.

Other less tangible factors, however, were given equal weight in our decision to locate the plant in Georgia. The spirit of enterprise which characterizes the rapidly developing South is exemplified to a marked degree in this state. We found fine community institutions — schools, churches, hospitals, hotels, and recreational facilities. Most important, we found friendly, cooperative, industrious people, eager and able to learn new skills and to work together as an effective team.

Since our fiberboard plant at Macon went into production in 1948, its efficiency and capacity have steadily increased and it is an expanding plant today — thanks in large measure to the cooperative effort of the employees.

Sincerely yours,

C.J. Backstrand

Mr. Scott Candler, Secretary
Georgia Department of Commerce
Atlanta, Georgia

FOR ADDITIONAL FACTS AND FIGURES, WRITE TO

Scott Candler
Dept. F

GEORGIA DEPARTMENT OF COMMERCE
100 STATE CAPITOL • ATLANTA, GEORGIA

No. 504 . . . easy to set-up . . . fast to use . . . precision made . . . gives perfect threads every time.

No. 4P geared die stock gives perfect threads on 2½" to 4" pipe with four sets (5 each) of dies.

No. 65R for perfect threading by hand or with power . . . for use on 1" to 2" pipe . . . jam-proof . . . kicks out automatically when standard length thread is cut.

Small Ratchet threaders capacity from ⅛"-2".

RIGID
PIPE THREADERS

Today, the craftsman is demanding more from the tools he uses. He buys tools based on performance . . . accuracy . . . dependability . . . and long service life. That's why RIGID Tools are number *ONE* in demand. They are designed and produced by men who have experience . . . who have devoted their lives to the manufacture of the finest line of pipe tools available.

**SPECIFY THE RIGID "502" . . .**
for use on any power drive. Single set of self-contained dies adjusts quickly to ½" and ¾" pipe . . . regardless of position of quick opening lever.

**SPECIFY THE RIGID "504" . . .**
for use on any power drive. One set of full width dies adjusts to 1", 1¼", 1½" or 2". Quick-opening dies retract immediately while power drive is operating . . . eliminates slow back-off. Four-jaw work-holder sets to size instantly . . . no lead screw jam.

RIGID
WORK-SAVER PIPE TOOLS

MANUFACTURED BY THE RIDGE TOOL COMPANY • 502 Clark Street, Elyria, Ohio


**FACTORY / EQUIPMENT NEWS**
*Begins on page 136*

For more about these products, circle item numbers on Reader Service card next to back cover.

**11—Reflectors,** porcelain-enameled, are useful where light must be concentrated. Accommodate 1000-watt incandescent lamps, 400-watt high- or low-pressure mercury-vapor lamps. Slotted necks allow air circulation, cutting dirt deposit. *Sylvania Electric Products, Inc.*

**12—Protector Valve** for presses with air clutches or brakes combines two units. Operating unit alone moves with stroke of press. Standby safety unit stops press if operating unit fails. Locks; cannot be reset until fault is corrected. *Clark Controller Co.*

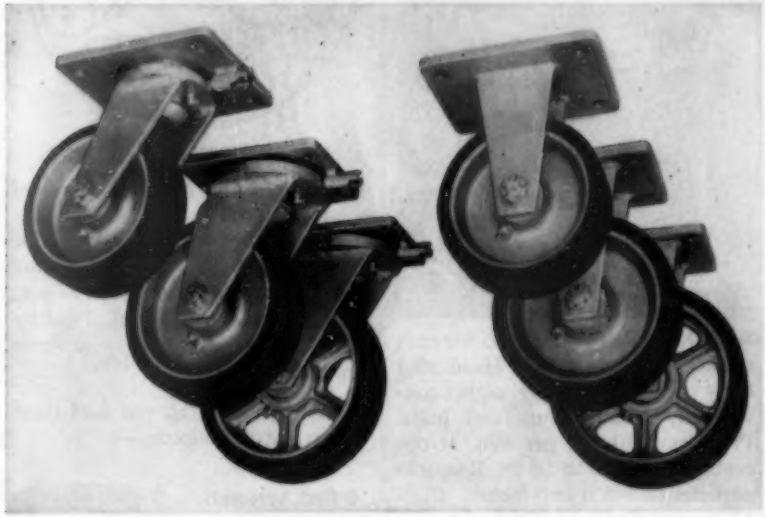
**13—Unit Heater,** gas-fired, is self-contained. Combines gas burners, combustion chamber, heat exchanger, motor-driven fan, fixed or revolving discharge outlets. Ceiling suspended, with downward discharge. Input: 430,000 Btu. per hr. *L. J. Wing Mfg. Co.*

*Turn the page*

# MATERIALS-HANDLING NEWS

★ Panel Discussions by Bassick, World's Largest Manufacturer of Casters and Floor Protection Equipment ★

## New Bassick "MilSpec" Casters meet military specifications

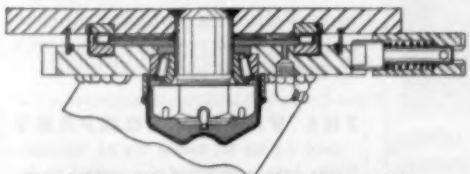


Bassick's new "MilSpec" line is specifically designed and engineered to meet the requirements of MIL-4749 and MIL-C-4750 for precision swivel and wheel bearings, sealed bearings, adjustable swivel bearings.

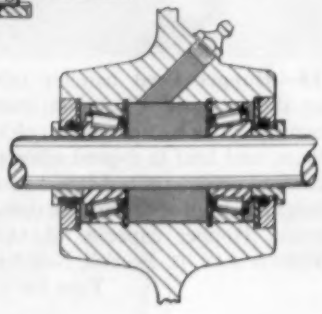
The new line includes 8, 10 and 12 in. heavy-duty, swivel and rigid casters for both inside and outside service on either hand- or power-pulled materials-handling equipment.

The swivel bearings are self-contained, precision units of the highest quality. Wheel bearings are the finest tapered type. Threaded king bolt and slotted nut construction make fine adjustment of swivel bearing possible.

### "MilSpec" sealed swivel and wheel bearing assembly



Gray areas show lubrication reservoirs.



Bassick's sealed construction keeps dirt, water and foreign matter out of both wheel (right) and swivel bearing (above) assemblies of "MilSpec" casters. Protective lubricant stays in to prolong life and insure easy action. Alemite pressure-type grease fittings permit flushing and re-greasing with standard grease guns.

### *MilSpec "Floating-Hub" Caster gives safe ride*

Important in the new "MilSpec" line is Bassick's famous "Floating-Hub" caster.

### Smothers shocks

It combines the shock absorption of "Floating-Hub's" sprung-wheel construction with the precision quality of "MilSpec" casters. MilSpec "Floating-Hubs" give any load a safe ride — should be first choice in handling any equipment subject to damage in moving.

### Tops on rough terrain

They're also better suited for higher speeds and rougher terrains than ordinary casters. And with adjustable precision sealed bearings, MilSpec "Floating-Hubs" will stay on the job long after lesser casters call it quits.

### Write for information

Write to Bassick for printed data on the new "MilSpec" casters. Remember — an original investment in quality casters pays off in added years of trouble-free, money-saving performance. Specify Bassick casters and you'll be sure you have the best.

There is an authorized distributor of Bassick casters conveniently located to give you service. He's always a good source of information about new product developments.

THE BASSICK COMPANY
Bridgeport 2, Conn.
*In Canada:*
Belleville, Ont.

**Bassick**
A DIVISION OF SW

## IS ICE CREAM AVAILABLE AROUND THE CLOCK FOR YOUR WORKERS?

**VENDO ICE CREAM VENDERS offer refreshment to everyone!**

There's no closing hour for a **Vendo Automatic Ice Cream Vender**—delicious ice cream is available whenever it's needed at break or lunch periods, *and at no cost to you.* It provides three-choice selection with big capacity.

Check these bonus features—

- **Three-column selectivity**
- **Built-in coin changer**
- **Minimum floor space—only 4 sq. ft.**
- **Handsome 2-tone enamel finish**

A Vendo representative will survey your plant and give you a point-by-point report of benefits to you with up-to-date ice cream vending equipment. A personal service—without obligation to you! Just mail the coupon below.

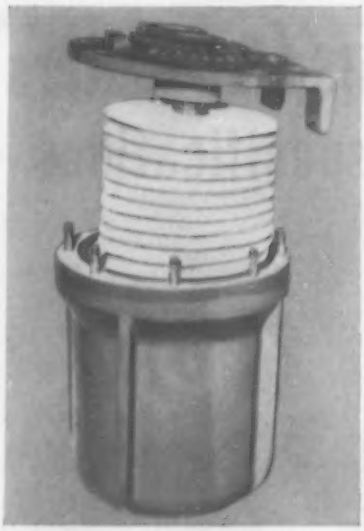
**THE VENDO COMPANY**
7400 E. 12th St., Kansas City 26, Missouri

Please have a representative contact me for further information on how I can obtain up-to-date ice cream vending service.

Name _____
Title _____
Firm _____
Address _____
City _____ State _____




For more about these products, circle item numbers on Reader Service card next to back cover.



**14—Disc Filter** is designed for easy replacement of discs. Head and body are attached by eight conveniently located nuts and bolts. Provides 5-50 gal. per min. at operating pressures to 50 lb. Removes particles of 3-5 micro-inches. *U. S. Hoffman Machinery Corp.*

**15—Hopper Feed** handles rolling or sliding parts. Cleats on moving conveyor pick up parts, elevate them, and feed to a production machine at predetermined rate. Loading height is 36 in with variable delivery point. Hopper capacity of Model 2200 is 4 cu. ft. *Feedall, Inc.*


*Turn the page*



## DO YOU HAVE ROUND-THE-CLOCK MILK SERVICE IN YOUR PLANT?

**VENDO MILK VENDERS provide daily 24-hour service!**

Day and night, cold-refreshing milk is available from a **Vendo Automatic Milk Vender** *at no cost to you.* It's the fastest, most practical and by far the most sanitary way to serve milk in your plant.

Nowhere else can you find these outstanding features—

- **Fast, automatic action**
- **Change-making mechanism**
- **Minimum floor space—only 4 sq. ft.**
- **Striking modern appearance**

Take advantage of Vendo's wide-awake service offer! Just mail the coupon below and a representative will call to show you—without obligation—the most profitable, efficient and easy way to provide 24-hour milk service in your plant.

**THE VENDO COMPANY**
7400 E. 12th St., Kansas City 26, Missouri

Please have a representative contact me for further information on how I can obtain 24-hour milk vending service.

Name _____
Title _____
Firm _____
Address _____
City _____ State _____

Slow-moving shipments kept Joe in a pickle,
His sour disposition nothing could tickle . . .

But now he's all sweetness—the light just broke through.
Could swift **RAILWAY EXPRESS** be your answer, too?

# The big difference is

Whether you're sending or receiving, whether your shipment is big or small, and whether it's moving by rail or air—you'll find it pays to specify Railway Express. It makes the big difference in speed, economy, and safe, sure delivery.

• • •

Railway Express uses the facilities of some 480 independent and competitive transportation companies in the movement of express traffic. It's free enterprise at its best, putting at your service one-third of a million miles of co-ordinated rail, air, water, and truck routes that connect all America.

RAILWAY EXPRESS AGENCY

**. . . safe, swift, sure**

# Lagging Public Construction — A Spreading National Blight

The most recent editorial in this series dealt with the plans of American industry for expanding and modernizing its plant and equipment over the next four years. These plans call for the expenditure of $113 billion over that period. There is a good prospect that the money to carry them out will be available. If the plans are carried out, manufacturing capacity at the end of 1958 will be double that which existed at the end of World War II. And this industrial plant will be modernized.

In sharp contrast to this picture is the condition of our *public* plant and equipment — the roads, schools, water supply, health and sanitation facilities upon which industry, as well as the average family, depends. **According to a recent estimate by the Twentieth Century Fund, the people of the United States must spend almost $100 billion on new public works projects during the next five years merely to meet the minimum needs of our growing economy.**

**Other estimates by the President's Council of Economic Advisers, by state agencies and by private construction economists all show the same condition: a staggering need for public works. Yet no steps have been taken that even offer a promise of closing the gap between the public facilities we are building and the greater facilities we really need.**

How did we come to let our public facilities fall into this sorry state? Here are some of the reasons:

(1) During the years of depression and war, from 1930 to 1945, these facilities were neglected. New construction declined, and even maintenance was cut.

(2) Since the end of World War II, increased construction costs have made it difficult for communities to get the needed construction with the funds budgeted in the past for that purpose.

(3) The great postwar upsurge in population, and the spreading of our population into new areas, has created a huge demand for additional community facilities before the neglect of earlier years could be made up.

## Responsibility Divided

Now the need for more public construction has become apparent to everyone, on jammed highways and in over-crowded schools. But, unfortunately, the responsibility for doing something about this situation cannot be so clearly fixed as can the responsibility for maintaining industrial facilities. A business firm must expand its capacity when markets are growing or lose its trade position. It must modernize its plant and equipment or be undersold by more efficient competitors. In the case of public facil-

ities, there is no such competitive incentive. To be sure, a city or state may lose population and industries if its public facilities are inadequate. But such shifts are very slow to take place and difficult to relate to any specific public program, or lack of it.

Moreover, the responsibility for constructing public facilities is divided between state and local governments and federal authorities. Within each of these governmental units there are specialized bureaus or departments with varying responsibilities. This division of responsibility obviously adds an element of difficulty to the development of an adequate program of public construction.

## Breaking the Log-Jam

How can this administrative log-jam be broken and the financial difficulties overcome?

One course would be to have the federal government step in with a nation-wide new program of direct spending on public works. That would utilize the resources of the federal treasury for immediate action. But there are weighty objections to such extensive federal participation. One is that federal spending cannot be greatly enlarged without a corresponding increase in the federal control of decisions that normally have been left to local communities. Another objection is based on the fact that so long as we must maintain a large defense establishment, such an addition to federal spending means either higher taxes or a chronically unbalanced budget.

The other course is to rely primarily on local initiative, but with new and more effective federal aid to local governments. Such aid would help speed up planning and construction, and contribute toward a solution of the most burdensome financing problems, but in amounts sufficiently limited to require that most of the capital be raised locally.

## No Single Formula

No one formula can be applied to make such aid effective. The raising of funds for new schools, for example, involves problems very different from those of financing highways, or water-works, or hospitals. But it does seem clear that, in all these fields, the federal grants must be designed to stimulate more local planning and financing than has prevailed in the past. Among the new ideas that may offer such incentives are federal grants for planning and initial costs and federal guarantees of local bond issues. Such aids have been remarkably effective in the fields of slum clearance and public housing.

While the federal government clearly has a role to play, we cannot afford to postpone inauguration of an adequate public construction program while we seek a formula to apportion governmental participation that would be generally accepted as ideal. Every year about 2½ million more Americans are putting increasing pressure on a public plant already dilapidated and inadequate. The result is an increasing menace to comfort, health, education and safety. It is also an increasing menace to the effective performance of American industry.

**The appropriate public response to this situation is a driving public determination to eliminate this increasingly dangerous lag in public construction. At this juncture, the development of such a determination is basic. Nothing stands in the way of an adequate program of public construction that a determined electorate cannot remove.**

*This message is one of a series prepared by the McGraw-Hill Department of Economics to help increase public knowledge and understanding of important nationwide developments that are of particular concern to the business and professional community served by our industrial and technical publications.*

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Donald C. McGraw

PRESIDENT

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# 4-wheel drive does another job better!

**MOBILE POWER**

Double-barreled power – that's the Universal 'Jeep'. It has the tractive power to reach the jobs, then furnishes power from its own 'Jeep' engine to operate auxiliary equipment, such as this welder mounted in the 'Jeep'. Power take-off also supplies power for compressors, generators, hoists and other equipment. Ask your nearest Willys dealer to demonstrate this "go-anywhere" many-purpose vehicle, or write for information.

4-WHEEL DRIVE UNIVERSAL 'Jeep'®

**WILLYS...world's largest maker of 4-wheel drive vehicles**

WILLYS MOTORS, INC., TOLEDO 1, OHIO

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***World's finest standard prefabricated building!***

This new concept in design *guarantees* a better, longer-lasting building for any operation at less cost.

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MANUFACTURED FROM USS STEEL UNITED STATES STEEL

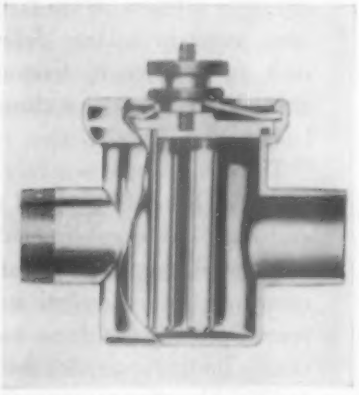

## FACTORY / EQUIPMENT NEWS

*Begins on page 136*

For more about these products, circle item numbers on Reader Service card next to back cover.

**16—Analyzer,** capacitance-resistance, detects opens, shorts, intermittents; highs, lows; leakage, power-factor; insulation resistance. For measurements between wires and shieldings; transformer windings, cable wire; similar conditions. *Cornell-Dubilier Electric Corp.*

**17—Metal Partitions** are easy to install; allow flexible arrangements of private offices and rooms, semi-private enclosures, railing-high divisions. Interchangeable parts in 3 heights, 10 widths. Posts equipped with leveling device and rubber foot. *Martin-Parry Corp.*



**18—Pipeline Traps,** magnetic, remove iron from water, oil, brine, chemicals, coolants. New design affords 300-400% greater trapping area. Only maintenance: periodic removal of accumulations. Tube cover easily unscrewed. Fits ½- to 4-in. lines. *Eriez Mfg. Co.*

**FACTORY / EQUIPMENT NEWS**
*Begins on page 136*

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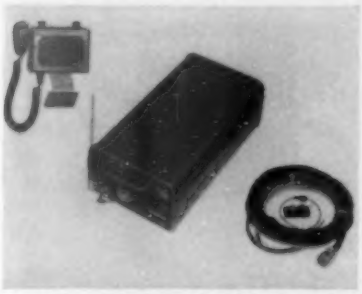


**19—Two-Way Radio** is for communication between dispatch point and materials handling vehicles. Carfone-150 operates on 6- or 12-volt motor-driven vehicles or higher-voltage electric trucks. Compactly styled, economical to operate. *Radio Corp. of America.*

**20—Chain Hoists** are all-steel, spur-geared, hand units. Feature compact snag-proof and weather-tight full enclosures. "Zephyr" line is lightweight, making units easily portable. Require low headroom. Includes ½- to 5-ton capacities. *National Screw and Mfg. Co.*

**21—Truck Leveler** raises or lowers rear of truck or trailer, bringing bed to dock level with minimum incline. Eliminates "hanging up" of low-underclearance pallet trucks on sharp incline; obstructions that restrict traffic. For new or old buildings. *Rotary Lift Co.*

**22—Refrigerating Machines,** absorption type, are for large-capacity air conditioning and process cooling. They have no major moving parts. Produce chilled water from hot steam. 11 sizes; 100-700 tons. *Carrier Corp.*

*Turn the page*

# 4-wheel drive does another job better!

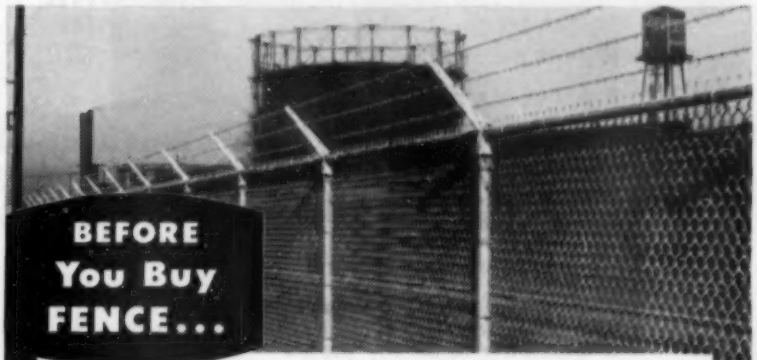
**HAULING**

Here's a rugged, all-purpose vehicle that does a job for you 365 days a year—the 4-wheel drive Universal 'Jeep.' It carries loads up to a half-ton and tows trailers many times its own weight. It travels in conventional 2-wheel drive on paved roads but shifts easily into 4-wheel drive when extra traction is needed, on or off the road. Equipped with power take-off, it furnishes mobile power for many types of industrial equipment. Ask your Willys dealer for an on-the-job demonstration.

4-WHEEL DRIVE UNIVERSAL **Jeep**®

**WILLYS...world's largest makers of 4-wheel drive vehicles**

WILLYS MOTORS, INC., TOLEDO 1, OHIO



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**Get the Facts on CONTINENTAL**

**The Only— Chain Link Fence made of KONIK STEEL**

Konik is a special alloy steel that gives Continental Chain Link Fence *increased rust resistance* for longer life and lower upkeep costs. Its *greater tensile strength* (over 85,000 lbs. per sq. inch) withstands abusive shocks and stresses, extremes of temperature, without sagging or losing alignment. *Bright-galvanizing* after weaving and 13 other features mean extra protection and fine appearance. Complete engineering and construction service.

KONIK STEEL

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Gentlemen: Please send us without obligation a copy of "Planned Protection."

Name_____

Firm_____

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**CONTINENTAL**

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**PRODUCERS OF:** Manufacturer's Wire in many sizes, shapes, tempers, and finishes, including Galvanized, KOKOTE, Flame-Sealed, Coppered, Tinned, Annealed, Liquor Finished, Bright, and special wire. ALSO Coated and Uncoated Steel Sheets, Nails, Continental Chain Link Fence, and other products.

# with KEX wiping towels...

## Because Every Square Inch is Usable—and KEX Industrial Wiping Towel Rental Service...

- Is more economical
- Supplies towels that are safe to use
- Simplifies handling
- Saves man hours
- Better equips our men
- Relieves me of shopping around
- Is a national service I can depend on
- Is available to *all* my plants

*For complete information see your Classified Telephone Directory for nearest Kex distributor, or write Kex National Service, 295 Fifth Avenue, New York 16, N. Y.*

"KEX" NATIONAL SERVICE

REG. U.S. PAT. OFF.

*It isn't Kex unless it's imprinted with the Kex name*



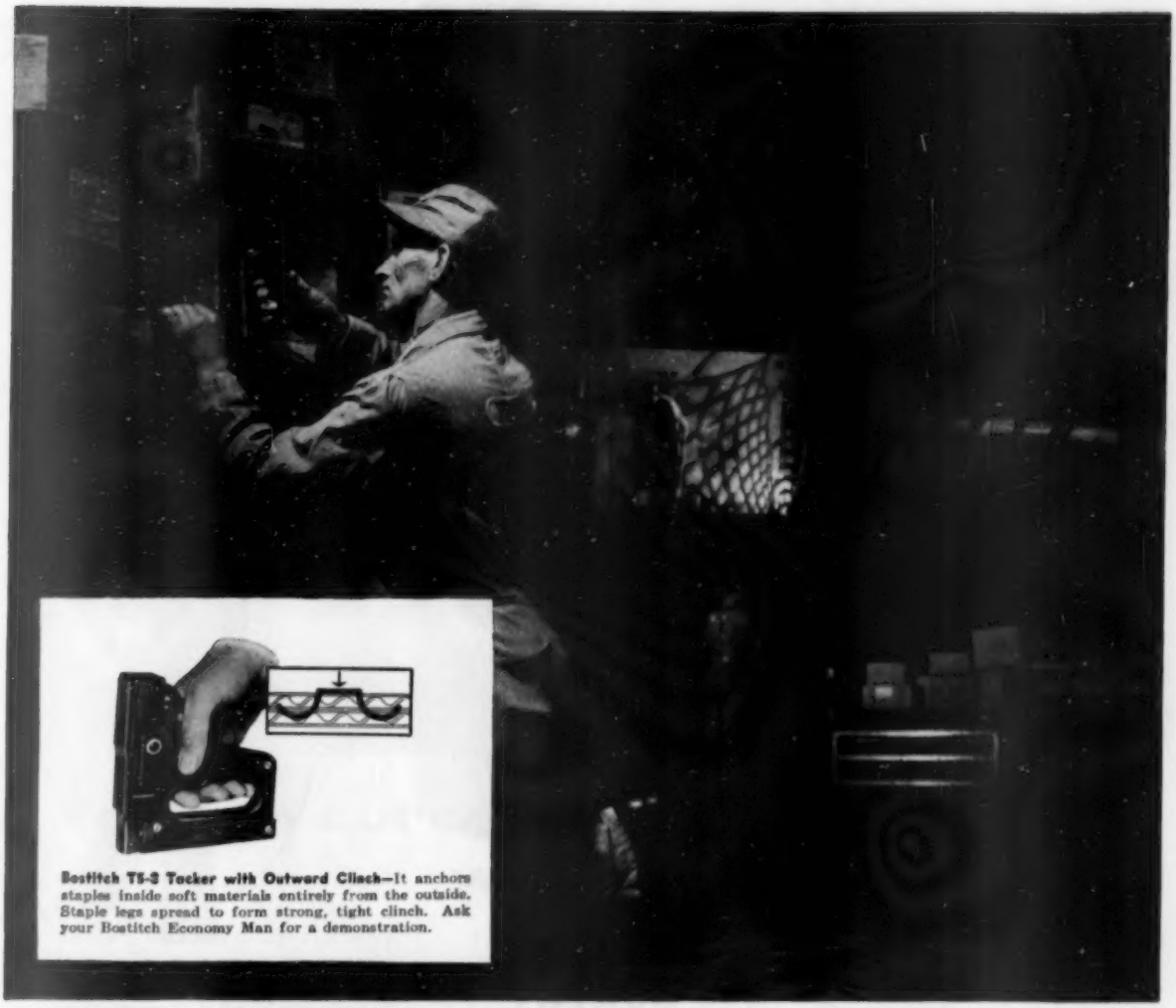

For more about these products, circle item numbers on Reader Service card next to back cover.

**23—Current-Capacity Tester** tests overload of circuits before adding additional electrical line load, such as grinders, lathes, drill presses, conveyors. Tests 115-volt line to furnish any value motor starting current from 13-50 amp. *Simpson Electric Co.*

**24—Gear Gage** automatically sorts gears to established tolerances. Handles 1000 per hr. Signals when pitch diameter falls outside limit; when hob begins to dull. Removes power from hobbing machine if it produces too many gears. *Airborne Instruments Laboratory, Inc.*

**25—Conveyor Junction** transfers materials to or from a live-roller conveyor. Consists of straight section and spur, which angles into straight section at 37½ deg. Powered by right-angle gear-head motor. For new systems, or expanding old ones. *Rapids-Standard Co.*

*Turn the page*





**Bostitch T5-S Tacker with Outward Clinch**—It anchors staples inside soft materials entirely from the outside. Staple legs spread to form strong, tight clinch. Ask your Bostitch Economy Man for a demonstration.

**STAPLES HOLD BETTER AT ONE-TENTH THE COST!** Trans World Airlines overlook no detail in assuring the safe, swift arrival of air freight shipments. Shipping bills fastened to cartons with even the best tape sometimes tore loose in damp climates. And taping cost $14 per thousand bills. A Bostitch Economy Man suggested stapling the bills with a new Bostitch tacker that "spread-eagles" staple legs inside carton walls. TWA tried it, found stapling four times faster and *far superior in holding power*. Cost: $1.40 a thousand. Now all major TWA stations are Bostitch-equipped!

# How much can you save by switching to Bostitch stapling?

Your Bostitch Economy Man can tell you. He's one of 350 trained fastening specialists working out of 123 cities in the U. S. and Canada. There are over 300 kinds of Bostitch staplers in his cost-cutting repertoire. Look up "Bostitch" in your telephone directory, or check the coupon at the right.

***Fasten it better and faster with***

**BOSTITCH**
STAPLERS AND STAPLES

BOSTITCH, INC., 608 Mechanic St., Westerly, R. I.

I'd like to know exactly how stapling can cut costs in our fastening operations. I'm particularly interested in the following applications (please check):

**HI-SPEED PRODUCTION FASTENING**
- ☐ stapling vs. riveting
- ☐ stapling vs. spot welding
- ☐ stapling vs. screws or bolts
- ☐ stapling vs. glue or cement
- ☐ stapling vs. tape
- ☐ stapling vs. tacks or nails
- ☐ stapling vs. solder
- ☐ stapling vs. wire or string

**PACKAGING AND CARDING**
- ☐ sealing bags (cloth, paper or plastic)
- ☐ mounting products on display cards
- ☐ fastening items to individual cards

**SHIPPING ROOM ECONOMIES**
- ☐ preparing cartons for filling
- ☐ sealing filled cartons
- ☐ lining or padding crates
- ☐ applying shipping bills or tags

**BUILDING APPLICATIONS**
- ☐ applying asphalt roofing
- ☐ laying underfelt
- ☐ installing ceiling tile
- ☐ applying insulation
- ☐ installing low-voltage wiring
- ☐ applying shake shingle siding

**OFFICE EFFICIENCIES**
- ☐ filing
- ☐ routing
- ☐ posting
- ☐ binding folders and reports
- ☐ preparing advertising dummies

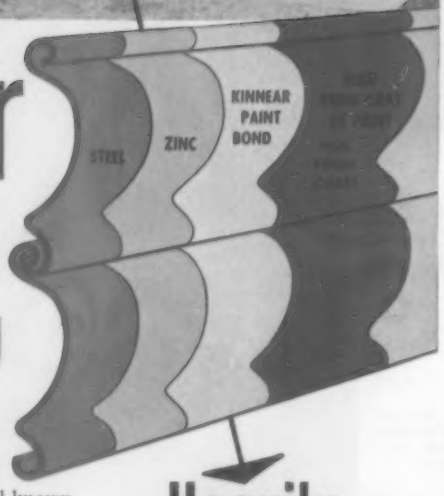
*Name* _____ *Position* _____

*Company* _____

*Address* _____

*City* _____ *Zone* _____ *State* _____

# Kinnear Steel Rolling Doors




Kinnear Rolling Doors are as well known for *extra years of service* as for convenience, space-economy and protection.

Two of the major reasons for this are shown in the drawing above at right.

The rugged interlocking steel slats are *heavily* galvanized — with 1.25 ounces of pure zinc per square foot of metal, by ASTM standards.

Then Kinnear's Paint Bond, a special phosphate solution is applied to make sure paint applied later will *cover thoroughly, adhere immediately, and stay on longer.*

That's why Kinnear Rolling Doors cut maintenance costs to the bone, and deliver peak efficiency year after year!

Opening straight upward, Kinnear Rolling Doors coil compactly *out of the way* above the doorway. Materials placed within inches of the face of the door curtain won't hinder its smooth, easy operation. Surrounding floor and wall space is fully usable at all times.

Kinnear Rolling Doors are built to fit openings of any size. Kinnear Motor Operators add the convenience of push-button control, with remote-control switches at any number of points, if desired.

Write for the latest Kinnear Catalog!

## Heavily Galvanized

**No wonder users report 30, 40 and 50 years of *efficient, daily service* from**

**KINNEAR**
ROLLING DOORS
*Saving Ways in Doorways*

**The KINNEAR Mfg. Co.**
FACTORIES:
1540-60 Fields Ave., Columbus, Ohio
1742 Yosemite Ave., San Francisco 24, Calif.
*Offices and Agents in All Principal Cities*




For more about these products, circle item numbers on Reader Service card next to back cover.

**26—Flame Controls** are available in two types. Design of "1400" Series is based on principle of flame rectification. Detection element of "1500" Series is a lead-sulphide photo-conductive cell that is responsive to infra-red. *Barber-Colman Co.*

**27—All-Angle Drill** gets into hard-to-reach places. Chuck (0- to ¼-in. capacity) swings in 270-deg. arc; handle turns in 180-deg. arc at right angles to chuck path. Proto No. 370 works around obstructions, can get close to floor and walls. *Plomb Tool Co.*

**28—Honing Machine,** single-spindle type with two-position fixture, can be loaded or unloaded while one piece is being honed. Model "SA" features automatic air gage built into mandrel. Requires only one operator. Built to specifications. *Superior Hone Corp.*

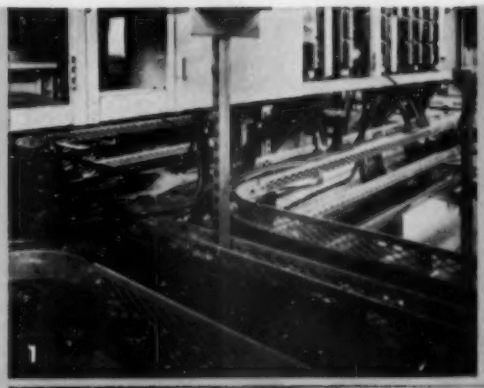
**29—Two-Way Radio** has high transmitting power—up to 100-watt signal. For communication over great distances—from mobile to mobile, or mobile to base station. Operates in 25-50 megacycle band. Chassis mounts in 14- or 17-in. housing. *General Electric Co.*

*Turn the page*

1. RoMarine-RoPrene's light weight and smaller diameters make it ideal for trays, racks and other metal raceway installations.

2. RoMarine-RoPrene is easy to pull in manholes and conduit or duct runs.

3. RoMarine-RoPrene is all-resistant to the effects of burial directly in earth.



# You can cut cable costs with this premium cable

Yes, it is true that in the long run it often costs less to buy the best. RoMarine-RoPrene power distribution cable proves it. It has an enviable performance record. In construction, it combines high quality RoMarine, heat- and moisture-resistant rubber insulation, with the ruggedness of RoPrene (Neoprene) sheath. Economy results not only from its dependability but from its versatility, as well. RoMarine-RoPrene is one cable that can be installed aerially, in ducts and conduits, buried directly in earth or in runs combining all three. Widely accepted for power-distribution circuits, there are many instances where it becomes a money-saving building wire. It costs but little more than the cheapest . . . yet more than makes up the difference with long life and electrical stability.

### *How you save*

Compared with cables having metallic coverings, RoMarine-RoPrene makes these economies possible:

- Lower original purchase cost
- Savings through reduced inventory
- Lower replacement costs
- Less termination and splicing expense with fewer accessories.

### *You get these advantages:*

- Exceptionally long service life
- Ease of terminating and splicing
- Light weight and smaller diameters
- No fibrous or other coverings to deteriorate
- Immunity to the effects of electrolysis, corrosion and temperature extremes
- High resistance to oils, acids, alkalies, moisture, abrasion, flame and weather.

### *Where you can use RoMarine-RoPrene®*

Generally recommended for 600-volt service, RoMarine-RoPrene is ideal for a multiplicity of applications by electrical utilities, in industrial plants, for rural electrification, airport wiring and residential services.

It is specifically approved by Underwriters' Laboratories, Inc. as Type USE for underground service entrances.

It is approved by Civil Aeronautics Administration for airport wiring, when CAA Specification L-824, with Type A insulation, applies.

It has been proved a superior product for general purpose wiring and, except under circumstances of the National Electrical Code, can be unhesitatingly recommended for 75°C. operation.

It will pay you to check into the economy and serviceability of RoMarine-RoPrene power distribution cables. Detailed specifications and prices are yours for the asking. Write or phone today for Bulletin RR-2.

*It Costs Less to Buy the Best*

ROME CABLE Corporation
ROME · NEW YORK
and
TORRANCE · CALIFORNIA

## Protect against wind driven rain, deterioration

Now you can get the tough durability and weather protection of rubber-base paint formulated especially for outside use. On any masonry surface, with Tropical's rubber-base Cementkote, you can brush on a tight coat of rubber that resists moisture penetration, protects and preserves against cracking or flaking. Unaffected by chemicals, it will not show streaks, yellow spots or alkali burns. Apply it to new construction without curing or seasoning delay! No primer or surface preparation of any kind necessary. Self-cleaning Cementkote restores fine appearance to old construction, immediately protects new construction against the elements.

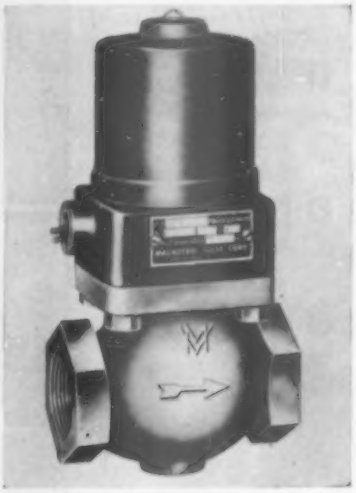
***FREE!*** **Your business letterhead request brings complete information on Rubber-base Cementkote for EXTERIOR masonry. Write us today!**

***GOT A SWIMMING POOL?*** **Tropical Pool Paint is rubber-base, non-fading; resists moisture, mildew, chlorine. Beautifies, protects. Needs no primer. Write for Pool Paint Bulletin.**

**TROPICAL PAINT COMPANY • 1122-1218 West 70th Street, Cleveland 2, Ohio**

**FACTORY / EQUIPMENT NEWS**
*Begins on page 136*

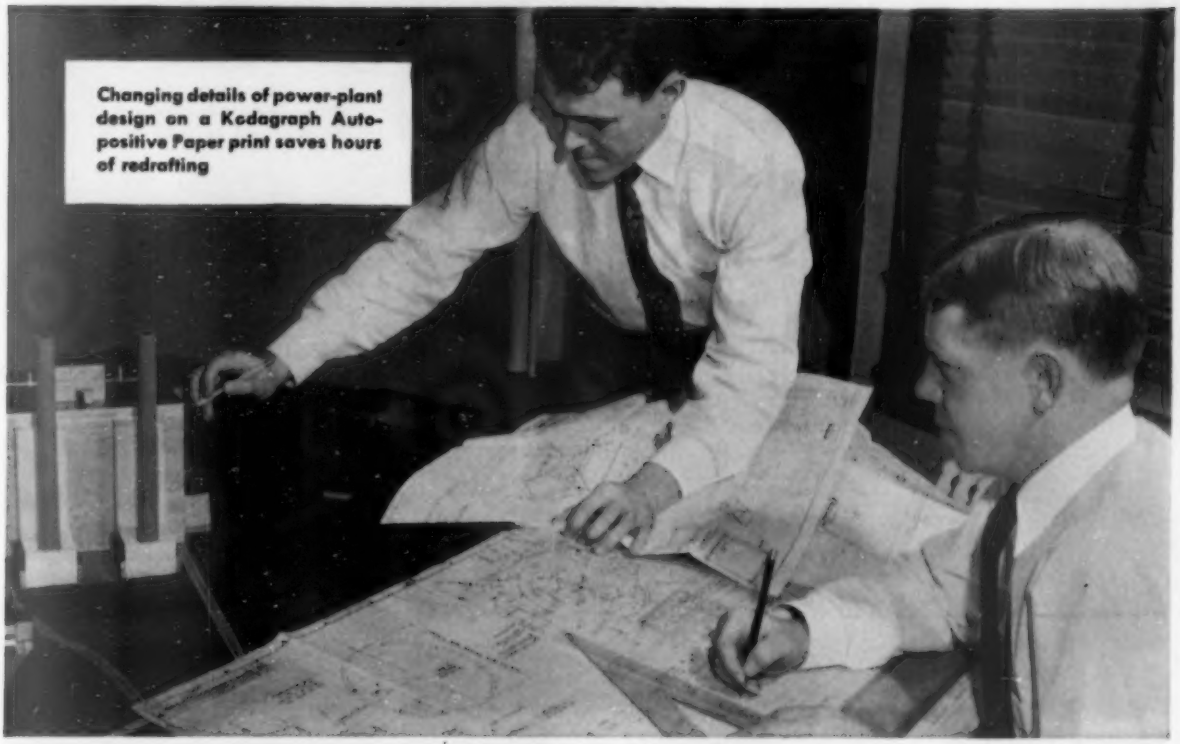
For more about these products, circle item numbers on Reader Service card next to back cover.



**30—Packless Solenoid Valve** is for high temperatures and pressures. Utilizes lines pressure to assist the solenoid in opening and closing valve. Type "S" is for steam, liquids, gases not harmful to bronze to 400 deg. F. Easy to service. *Magnatrol Valve Corp.*

**31—Coolant Pumps,** centrifugal, immersion type, have no packings or seals to wear. Totally enclosed, with ¼-hp. motors. Allow 24 electrical outlet positions without disassembling. Series 30 available to conform to JIC standards. *Graymills Corp.*

*Turn the page*



Changing details of power-plant design on a Kodagraph Autopositive Paper print saves hours of redrafting

## Toledo Edison Company reports on its use of Autopositive—

# "One saving after another since 1947"

Shortly after Kodagraph Autopositive Paper was introduced, the Toledo Edison Company, Toledo, Ohio, began exploring its possibilities for engineering drawing reproduction.

Here was a revolutionary photographic intermediate paper which produced positives directly from positives—no negative step. It could be exposed in standard print-making equipment . . . processed in standard photographic solutions. *Entire operation in ordinary room light, too.* Jobs which had been difficult and costly became easy and economical—Kodagraph Autopositive Paper costs only a few cents a square foot. Some typical savings at Toledo Edison *which you can duplicate* are listed here.

☐ **Old prints and intermediates reclaimed.** No time lost retracing. Autopositive Paper strengthens weak line detail, cleans up backgrounds. Toledo Edison now can get intermediates which have dense photographic black lines on an evenly translucent paper base. *Original quality or better!*

☐ **Opaque originals no problem.** Many of Toledo Edison's forms, charts, operating maps, etc., are on opaque stock—some two-sided. Data is added to these in pencil or by typewriter. Then Autopositive reproductions are made and used to produce the direct-process prints needed for distribution. The 1954 Annual Budget, for example, was reproduced in this manner. *Autopositive saves time and dollars for all departments.*

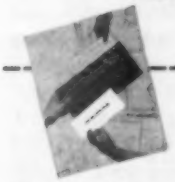
☐ **Print-making simplified.** Toledo Edison runs Autopositive intermediates at uniform, practical speeds in its direct-process machine . . . gets sharp prints time after time. *Autopositive lines do not smear, smudge, or lose density.*

☐ **Drafting shortcuts.** An Autopositive print is made of a drawing which has to be altered. The obsolete detail is eradicated or scissored out, and another Autopositive is made. New design is then added, and the job is completed without redrafting.

☐ **Photo-lasting file copies.** Toledo Edison also finds that Autopositive intermediates will not turn yellow or become brittle . . . are ready to produce sharp, legible prints whenever needed.

# Kodagraph Autopositive Paper

**"THE BIG NEW PLUS" in engineering drawing reproduction**



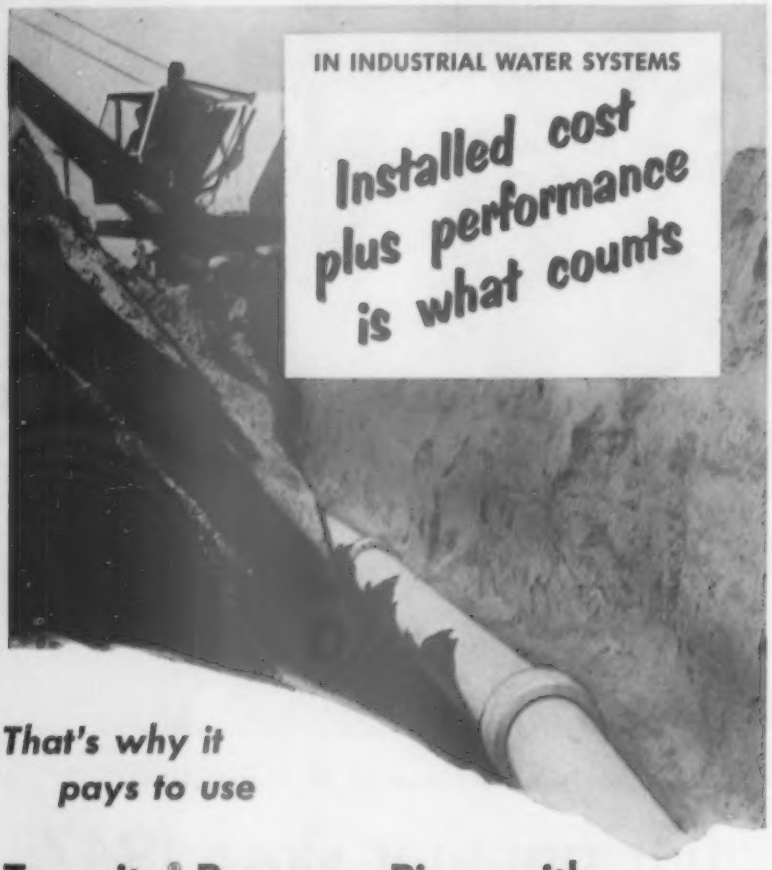
Shows all the ways you can save with Kodagraph Autopositive Paper.

MAIL COUPON FOR FREE BOOKLET

EASTMAN KODAK COMPANY 17
Industrial Photographic Division, Rochester 4, N. Y.
Gentlemen: Please send me a copy of "Modern Drawing and Document Reproduction."

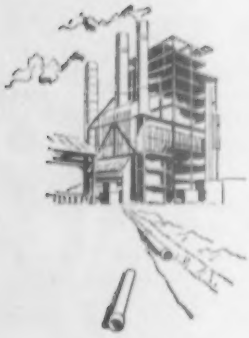
Name _____ Position _____
Company _____ Street _____
City _____ Zone ____ State _____

Kodak




*That's why it pays to use*

## Transite® Pressure Pipe with the Ring-Tite® Coupling



MEN RESPONSIBLE for successful water system installation and performance have found that Transite Pressure Pipe with the new Ring-Tite Coupling meets every requirement for industrial water lines. For example . . .

**Installed cost is lower**—Transite's light weight, easy handling and fast, accurate Ring-Tite Coupling simplify assembly and save time. May be installed even under difficult weather and terrain conditions. The Ring-Tite design automatically locks tight, forming a positive seal.

**Performance is high**—With Transite Pressure Pipe and the Ring-Tite Coupling, peak performance *can be counted on* year after year because of such engineering advantages as these: *Lasting* strength because of Transite's asbestos-cement, a strong durable material, highly resistant to corrosion . . . *Designed* tightness with the rubber rings of the Ring-Tite Coupling . . . *Assured* flexibility with automatic end positioning within the joint . . . *Locked in the groove* . . . rings can't blow out.

*For further information*

about Transite Pressure Pipe and Ring-Tite Coupling, write to Johns-Manville, Box 60, New York 16, New York.

**Johns-Manville TRANSITE PRESSURE PIPE**

**With New *Ring-Tite* Coupling**

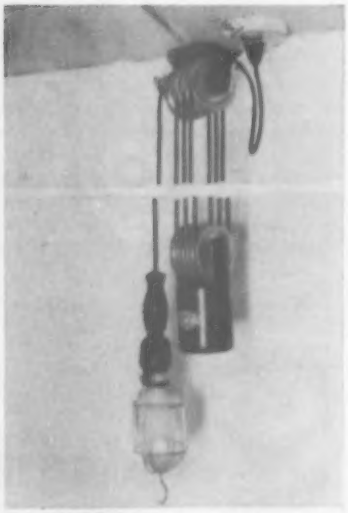



*Begins on page 136*

For more about these products, circle item numbers on Reader Service card next to back cover.

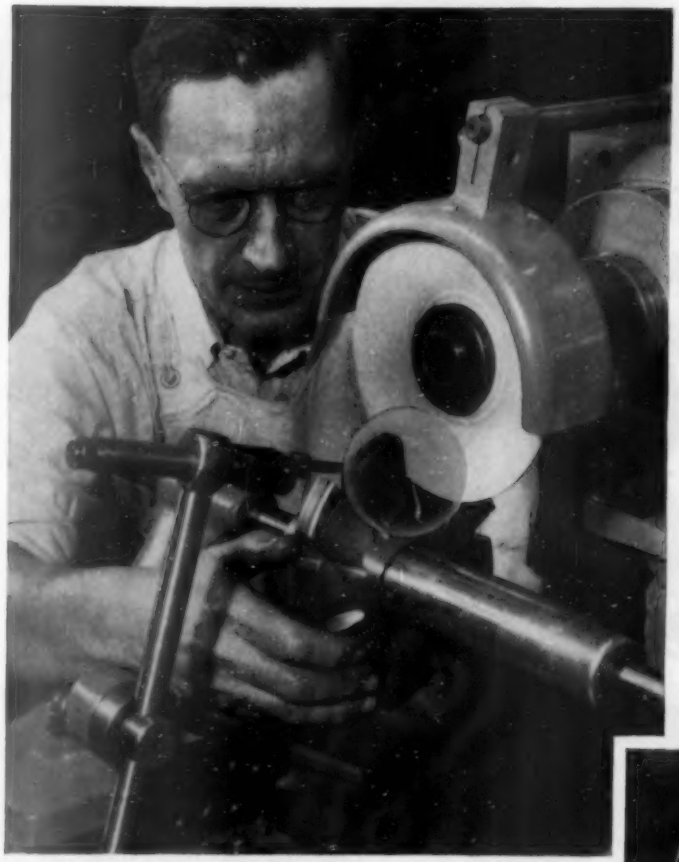
**32—Conveyor Traffic Controller** regulates flow of goods from two merging conveyors and eliminates jamming at point of intersection. Handles wide range of container types and sizes. For use with either belt or live-roller units. *Rapids-Standard Co.*

**33—Volume Meter** records weight of material on moving conveyor, though it may stop at undetermined intervals. Relies on constant volume of material. If volume should vary, meter will automatically shut down conveyor. Can sound alarm. *Elliott Co.*



**34—Take-Up Reel** holds wire where you want it. Features automatic locking device, fast-acting rewind. Overhead mounting protects cord, prevents snarls and kinks. Furnished with 25 or 50 ft. 16-2 cord. Models for 3- and 4-wire cord are available. *Hykon Mfg. Co.*

*Turn the page*



# Tools, and operators, keep their tempers with Norton wheels

*Only Norton builds these value-adding, time-saving* **"TOUCH of GOLD"** *features into wheels for tool room grinding*

**All teeth stay the same height** when you sharpen milling cutters with long wearing, free cutting Norton G Bond wheels that hold size all the way round. The machine is a Norton No. 20 Cutter and Tool Grinder.

**NORTON GENERAL PURPOSE WHEELS** →

Out-of-the-ordinary wheels for your ordinary bench or floor stand grinding. Available in the abrasive-and-bond combinations you need for economical, trouble-free performance. Chances are that any tool wheel or general purpose wheel you require is carried in stock.

Exclusive precision processing gives Norton tool room grinding wheels unusual advantages, including controlled uniformity, and built-in balance, that reduce vibration and assure smoother running wheels.

### *Plus The Famous G Bond*

Also, you can get these wheels in the most efficient vitrified bond ever produced — the Norton G Bond, developed especially for precision-grinding the hardest tool steels. G Bond wheels: *cut freer, cooler, faster . . . do more work per wheel . . . hold corners better, are better for form grinding, dress easier and grind more pieces per dressing.*

And for rapid stock removal, with especially cool cutting action, Norton 32 ALUNDUM* abrasive is outstandingly popular. All G Bond wheels reduce tool spoilage, give you closer tolerances and smoother finishes, with fewer wheel changes and machine adjustments — additional "Touch of Gold" benefits that mean better performing tools and better, lower-cost tool room grinding.

### *For Your Carbide Grinding*

Norton diamond wheels, carbide grinding's recognized "Crown Jewels", are made in all required bond types. Their accurate cutting action and extra long service life bring you top savings in every single point and multi-tooth carbide grinding application. Also available are CRYSTOLON* wheels — green or gray — with the cost-cutting K Bond.

### *See Your Norton Distributor*

Or write direct. And remember: only Norton brings you such long experience in both grinding wheels and grinding machines to help you produce more at lower cost. NORTON COMPANY, Worcester 6, Mass. Distributors in all industrial areas, listed under "Grinding Wheels" in your phone book, yellow pages. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Massachusetts.

W-1662

NORTON

*Making better products... to make your products better*

***and its BEHR-MANNING division***

NORTON COMPANY: Abrasives • Grinding Wheels • Grinding Machines • Refractories
BEHR-MANNING DIVISION: Coated Abrasives • Sharpening Stones • Pressure Sensitive Tapes

*Trade-Marks Reg. U. S. Pat. Off. and Foreign Countries

Hi-Dri new Hi-Dri new Hi-Dri new Hi-Dri new Hi-Dri
new Hi-Dri new Hi-Dri new Hi-Dri new Hi-Dri new
Hi-Dri new Hi-Dri new Hi-Dri new Hi-Dri new Hi-Dri

FOR HIGHER VALUE AND DRIER FLOORS

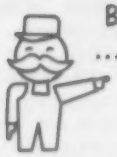
WAVERLY
Hi-Dri
all-purpose
oil and grease absorbent

*Newest and Best—*
*Put it to the TEST!*

BEFORE

AFTER

*Easy to apply*



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Better Buy Hi-Dri
...for a better buy!

*new Hi-Dri...* **high** in quality!
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*new Hi-Dri...* **high** in absorption!
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Company _____
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City _____ State _____

F

**FACTORY / EQUIPMENT NEWS**
*Begins on page 136*

For more about these products, circle item numbers on Reader Service card next to back cover

**35—Air Control Assembly** consists of filter with automatic-unloading water trap, regulator with 0-160 psi. gage, automatic lubricator. For all air lines, supplying air motor, cylinders, other fluid power devices. Needs little attention. *Modernair Corp.*

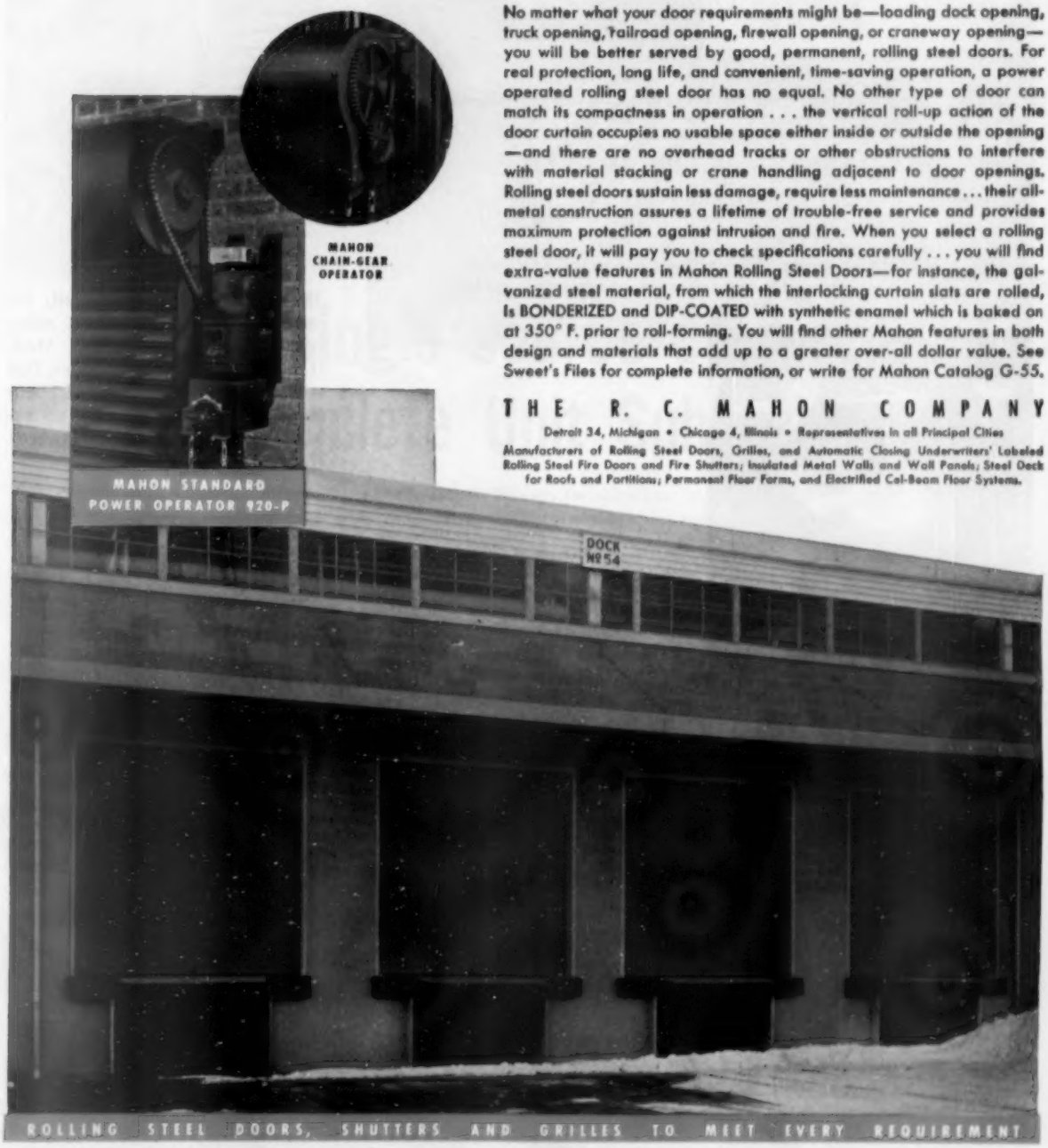
**36—Car Banding Tools** speed freight shipping. Feature built-in shears that eliminate separate cutting. Hand tightener in models for ¾- or 1¼-in. bands. Electric type tightens both ¾- and 1¼-in. bands to predetermined tension. *Stanley Works, Inc.*

**37—Slotted-Angle Shelving,** in addition to lengthwise slots, has round holes and transverse slots at 3-in. intervals in both legs. Round holes enable bolting. Transverse slots permit nesting or overlapping and splicing for greater length. *Acme Steel Co.*

*Turn the page*

# Rolling Steel Doors

*Manually, Mechanically, or Electrically Operated*




**No matter what your door requirements might be—loading dock opening, truck opening, railroad opening, firewall opening, or craneway opening—you will be better served by good, permanent, rolling steel doors. For real protection, long life, and convenient, time-saving operation, a power operated rolling steel door has no equal. No other type of door can match its compactness in operation . . . the vertical roll-up action of the door curtain occupies no usable space either inside or outside the opening—and there are no overhead tracks or other obstructions to interfere with material stacking or crane handling adjacent to door openings. Rolling steel doors sustain less damage, require less maintenance . . . their all-metal construction assures a lifetime of trouble-free service and provides maximum protection against intrusion and fire. When you select a rolling steel door, it will pay you to check specifications carefully . . . you will find extra-value features in Mahon Rolling Steel Doors—for instance, the galvanized steel material, from which the interlocking curtain slats are rolled, is BONDERIZED and DIP-COATED with synthetic enamel which is baked on at 350° F. prior to roll-forming. You will find other Mahon features in both design and materials that add up to a greater over-all dollar value. See Sweet's Files for complete information, or write for Mahon Catalog G-55.**

**THE R. C. MAHON COMPANY**

Detroit 34, Michigan • Chicago 4, Illinois • Representatives in all Principal Cities

Manufacturers of Rolling Steel Doors, Grilles, and Automatic Closing Underwriters' Labeled Rolling Steel Fire Doors and Fire Shutters; Insulated Metal Walls and Wall Panels; Steel Deck for Roofs and Partitions; Permanent Floor Forms, and Electrified Cel-Beam Floor Systems.

ROLLING STEEL DOORS, SHUTTERS AND GRILLES TO MEET EVERY REQUIREMENT

Four Mahon Power Operated Rolling Steel Doors installed in a loading dock with mechanical floor levelers in each opening. A total of thirty-nine Mahon Rolling Steel Doors were installed in various types of openings in this new Sutherland Paper Co. Plant, Kalamazoo, Mich. Miller-Davis Co., Designers and Gen. Contrs.

# MAHON

"One day we were using 14 hand sprayers ...the next day, 2

"One day we were using 180 gallons of paint ...the next day, 75

"Fantastic?" Not exactly. It's a typical, on-the-job-example of the savings made possible with the

RANSBURG NO. 2 PROCESS

Electrostatic Spray Painting

And, in this instance* production was increased; quality of the work improved, and rejections cut to practically nothing.

*Fluorescent Fixtures of California, in their modern plant in South San Francisco, uses the Ransburg No. 2 Process Reciprocating Disc Atomizer to paint their popular line of ALL-BRITE lighting fixtures. The quotes above are from Works Manager, R. H. Shaffer.

Regardless of the type of product you manufacture, if it's painted... and, if your production justifies conveyorized painting, you should look into the savings (and improved quality) which can be yours with one of the Ransburg Electrostatic Painting Processes. May we tell you about complete Ransburg services?

Dept. FM

Ransburg ELECTRO-COATING CORP.

Indianapolis 7, Indiana

RANSBURG

**FACTORY / EQUIPMENT NEWS**

*Begins on page 136*

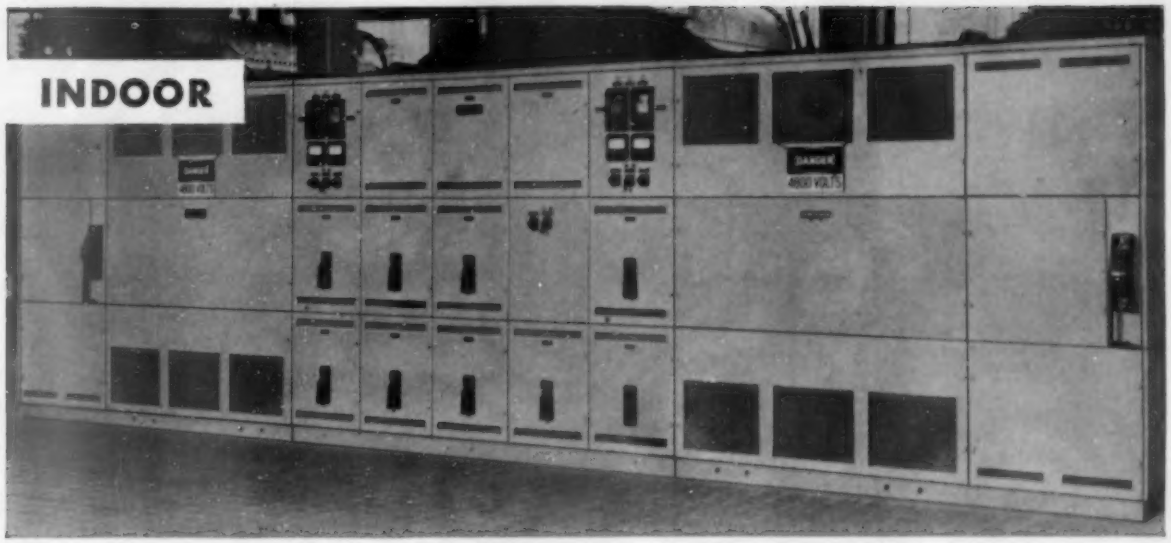
For more about these products, circle item numbers on Reader Service card next to back cover.

**38—Gas-Electric Power Unit,** for motorized walkie and small rider-type trucks, is bantam-size. Model W engine, generator, muffler, fuel tank, and all accessories are enclosed within housing, with no external projections. 12-volt system. *Ready-Power Co.*

**39—Lifting Device,** rack and pinion type, is for handling parts or various solid articles—all the same diameter and width. Loaded box remains upright, but can be tilted for dumping. Can be furnished with different types of lifting legs. *H. L. Bushman Co.*

**40—Different Float Valve** is for use where fast-acting full "off" and "on" control is required. Maintains liquid levels in tanks, other containers. Automatically controls ejection of gathered liquids in sumps and other collecting areas and devices. *Klipfel Valves, Inc.*

*Turn the page*



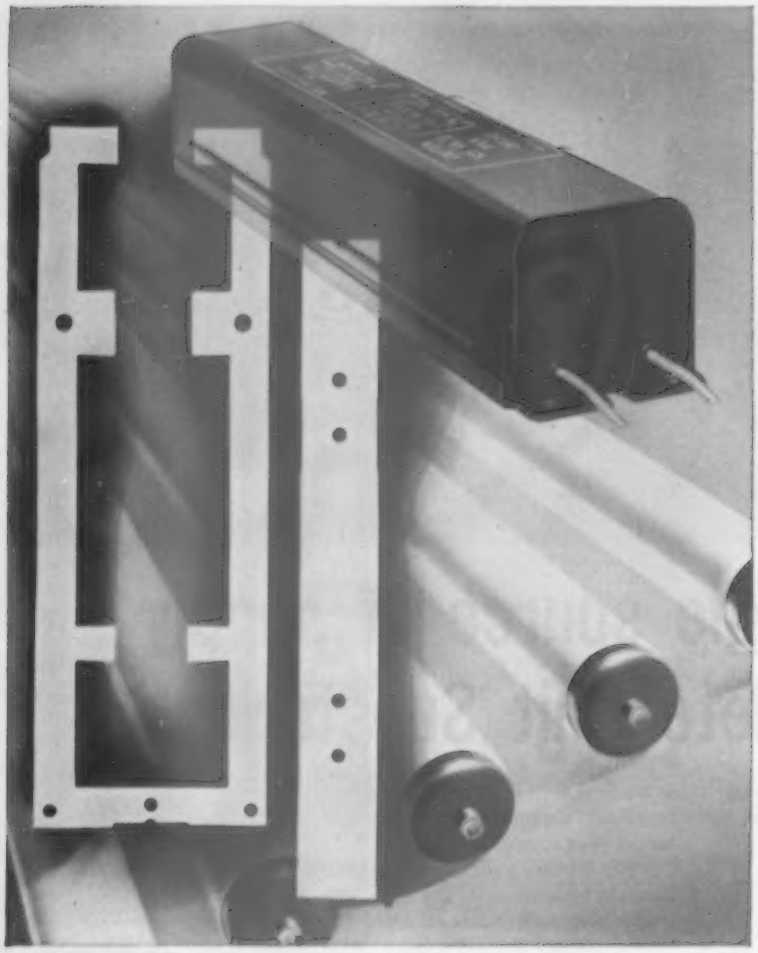

# I-T-E, single source of supply for complete Unit Substations

You can buy a unit substation either of two ways: a piece at a time (the expensive way), or all at once (the economical way). I-T-E can sell you the individual elements, but recommends that substations be purchased complete, and from a single source of supply.

This way, you get more value from I-T-E's engineering assistance in over-all planning. The unit substation, including primary breakers or switches, liquid or dry type transformers, and secondary distribution switchgear with air circuit breakers, is assembled, tested and shipped as a unit ready for immediate installation. You have one dependable company that stands behind your complete installation.

I-T-E Primary and Secondary Unit Substations can be supplied for any application indoor or outdoor, and in any standard rating. For details, contact the I-T-E sales office nearest you. Look in your classified directory under "Electric Equipment." I-T-E Circuit Breaker Company, Switchgear Division, 19th & Hamilton Sts., Philadelphia 30, Pa.

**I-T-E CIRCUIT BREAKER COMPANY, Switchgear Division**



# 30% lower price

***New Westinghouse slimline lead-lag ballast, with UI design***

**Exclusive UI core design brings you double benefits. First, price has been reduced approximately 30%, giving even greater lead-lag economy—no lamp replacement guesswork—longer ballast life. Second, new design means more ballast for your money for these reasons: *Quiet*—fewer lamination joints minimize vibration. *More efficient*—new core design and clamping method reduce iron losses. *Cooler*—electrical losses are reduced and heat is distributed more evenly.**

**See your nearby Westinghouse representative for complete details, or write Westinghouse Electric Corporation, Lighting Division, Edgewater Park, Cleveland, Ohio.** J-04385-A

YOU CAN BE SURE...IF IT'S Westinghouse

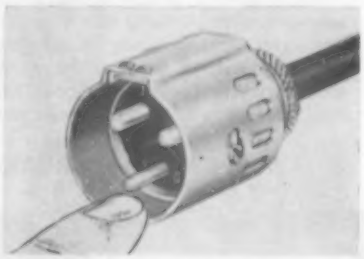
**FACTORY / EQUIPMENT NEWS**

*Begins on page 136*

For more about these products, circle item numbers on Reader Service card next to back cover.

**41—Pneumatic Temperature Control** is for all installations where control is by varying flow of gas, steam, or other medium with air-operated valve or motor. Model HA handles pneumatic systems to 50 psi.; temperatures to 1800 deg. F. *Burling Instrument Co.*

**42—Speed-Corrector Drive** incorporates both variable speed drive and built-in differential. Provides small, but accurate changes where one portion of machine must be timed with respect to another, with small adjustments required. *Graham Transmission, Inc.*



**43—Plugs and Receptacles** for portable and detachable electrical devices have round prongs for positive contact and added mechanical strength. Contact units are interchangeable, reversible, versatile, designed for 10 assembly combinations. *Pyle-National Co.*

**44—Liquid-Sensing Device** detects presence or absence of liquids of −319 to +200 deg. F. Acts as fuel system low-level warner, high-level cut-off; sequences liquids from one tank to another. Operates alarms; controls pumps, valves, motors. *Air Associates, Inc.*

*Turn the page*

# LeBLOND of Cincinnati AT THE SHOW

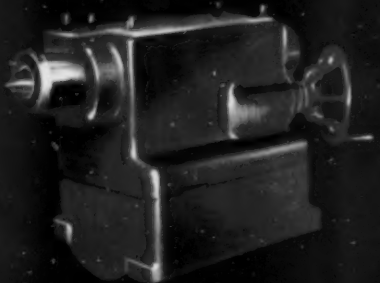
NEW 16" APRON

NEW 15" DUAL DRIVE

NEW 32" SPINDLE

NEW HEAVY DUTY BED

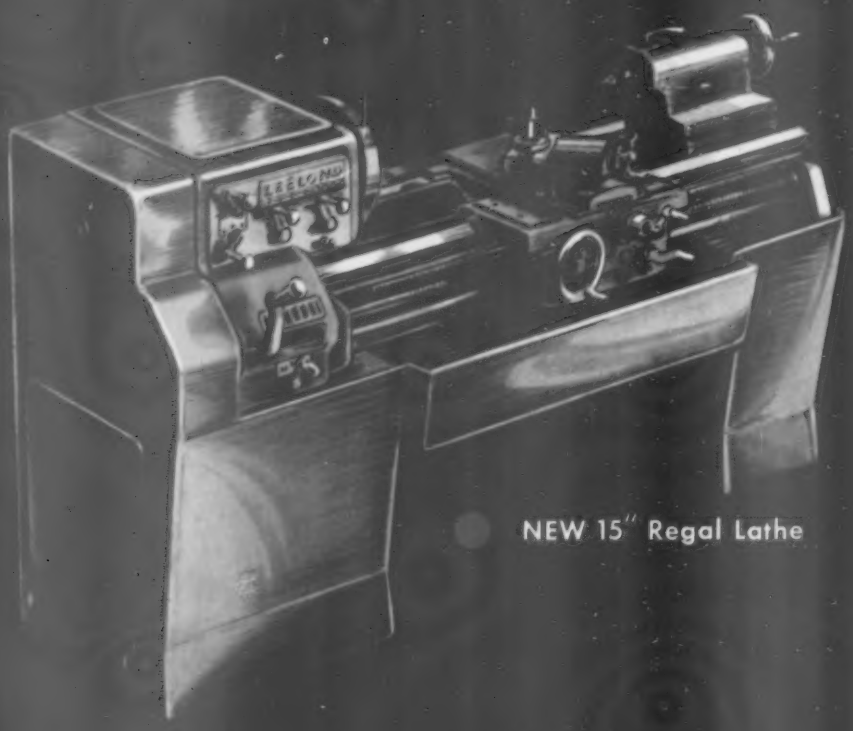
50" ROLL TURNING LATHE



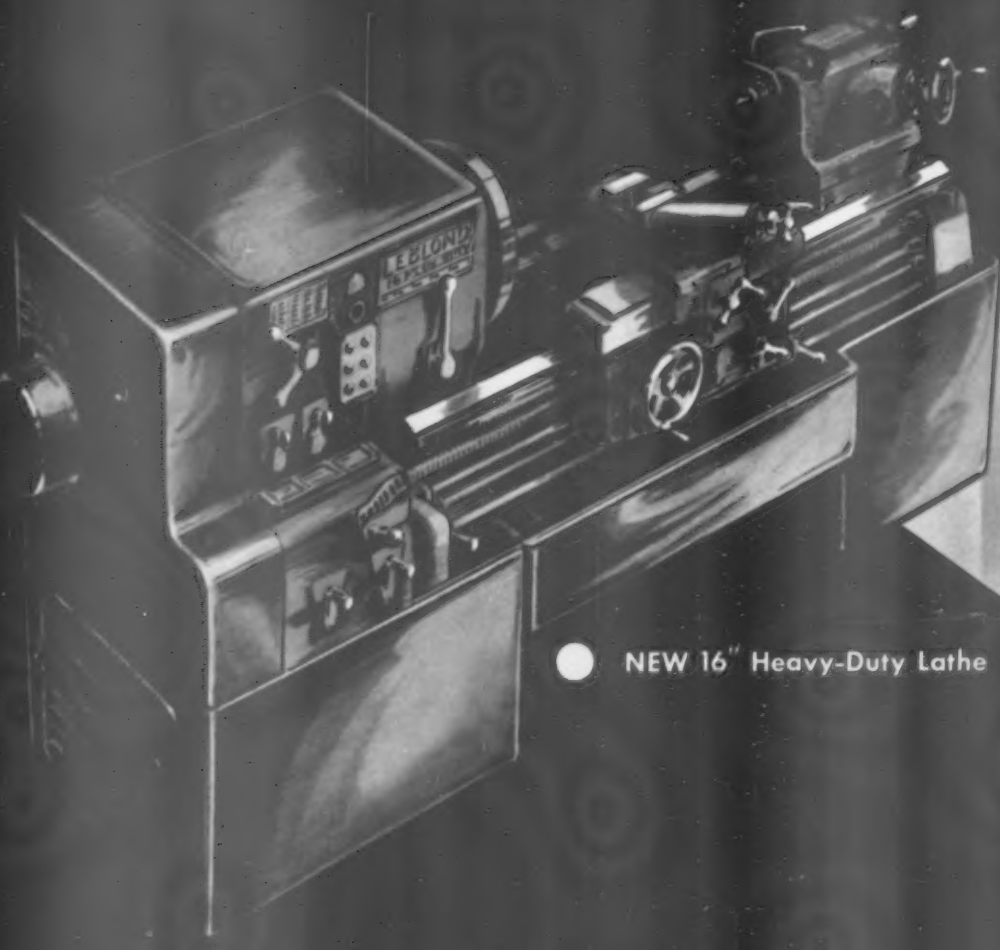
NEW HEAVY DUTY TAILSTOCK

NEW 13" REGAL

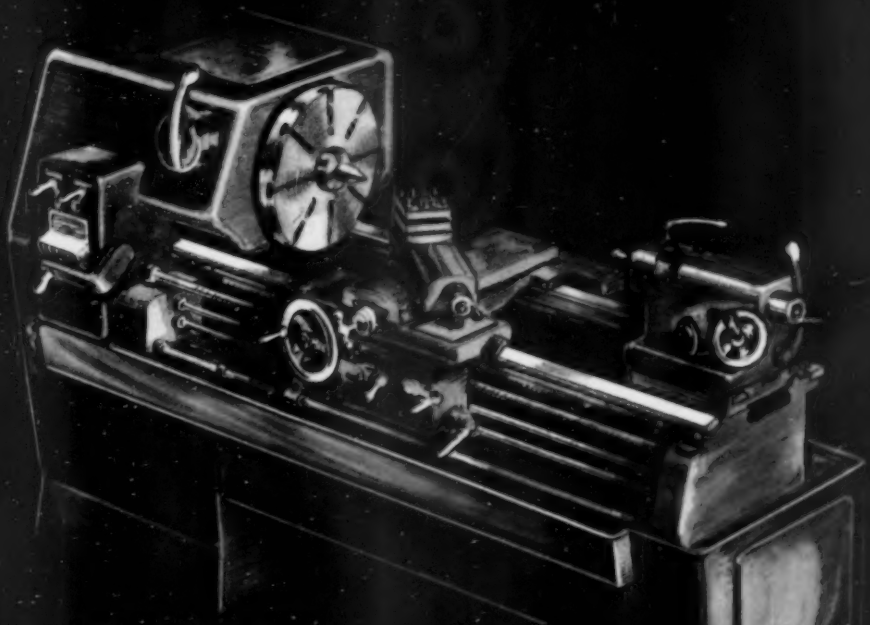
Turn the page for a preview



NEW 15" Regal Lathe



NEW 16" Heavy-Duty Lathe



NEW 15" Dual Drive Lathe

## CUT WITH CONFIDENCE... WITH THESE

# NEW LeBLONDS

### 13", 15", 17" and 19" Regals

Designed and built like heavy-duty lathes, the new LeBlond Regals offer a long life of precision production, minimum maintenance and true big-lathe dependability! New headstock uses proven gear-belt drive design. New bed has replaceable hardened and ground steel ways. Other big-lathe features—Separate feed rod and leadscrew. 3-bearing spindle. Automatically-lubricated quick-change box. Many more. *Ask for Bulletin R-200S.*

### 15" Dual Drive

For medium-duty performance at low cost, the new LeBlond Dual Drive is number one! With a single lever you get 16 spindle speeds from 30 to 2400 rpm. The headstock is of combination gear-belt drive design with a 3-bearing spindle. Motor is 5 hp., 1800 rpm. Quick-change box is totally-enclosed. Replaceable hardened and ground steel ways are fitted to the compensating veeway principle for the best distribution of forces. *Ask for Bulletin 6S.*

### 16" Heavy Duty

Completely redesigned from top to bottom, our new 16" is the most advanced heavy duty in the business! The combination gear-belt drive headstock provides 27 spindle speeds. The center spindle bearing is supported in the new Timken "semi-flexible mounting" for precise support throughout the speed range. Four-way power rapid traverse. 20 hp. Totally-enclosed quick-change box. Replaceable hardened and ground steel bed ways. *Ask for Bulletin HD126S.*

# LeBLOND of Cincinnati AT THE SHOW

We are extremely proud of the major design advancements you'll see at the LeBlond Exhibit—No. 1313, dead center in the new Exhibition Hall. You'll see 16 of the world's most modern lathes. You'll witness unique demonstrations in tracing, rapid boring and high-power turning. *Don't miss LeBlond!*

**NEW 13", 15", 17" and 19" Regal Lathes**

Famous for dependable performance at low cost, our Regals have been redesigned from the ground up! Big-lathe features include — Combined gear and belt-drive headstock. Replaceable hardened steel bedways. Separate feedrod and leadscrew.

**NEW 15" Dual Drive Lathe**

Best buy in the medium-duty class, the new Dual Drive features 16 speeds from 30 to 2400 rpm through a combined gear and belt-drive headstock. 5 hp. Replaceable hardened steel bedways. Totally-enclosed quick change box.

**NEW 16" Heavy Duty Lathe**

Most popular of the heavy duties, our new 16" provides 27 speeds from 16 to 2000 rpm through a combined gear and belt-drive headstock. 20 hp. Four way power rapid traverse. Replaceable hardened steel bedways. Enclosed quick change box.

**RT Toolroom Lathe**

Even today, other lathes can't match the advanced designs pioneered by LeBlond in the RT. Universal QC box—90 feeds and threads. Automatic chasing stop. Combined feed apron with built-in taper attachment.

**NEW 25" and 32" Heavy-Duty Lathes**

Cut with confidence at high horsepower! New headstocks use heavy, short shafts; 4-bearing spindle; provide adjustable accelerations for starting, stopping, jogging. 50 hp on the 25", 60 hp on the 32".

**NEW 32" Special Heavy-Duty Lathe**

You'll see well over 100 hp actually used at the tool. Built for Carboloy to test the newest in carbide tooling, this special 32" uses a 125 hp, variable speed drive, provides speeds from 42 to 1400 rpm.

**NEW 25"/50" Sliding Bed Gap Lathe**

A brand new model of this most versatile of lathe designs. Headstock provides 36 spindle speeds from 6 to 625 rpm. Adjustable acceleration for starting, stopping, jogging. New bed increases stability, easy cleanout.

**50" Roll Turning Lathe**

See how huge steel mill rolls are contoured in less than half former time. Two-directional hydraulic tracing from a simple template. Feed and speed can be varied during cut without leaving a tool mark.

**NEW Automatic Crankshaft Lathe**

Fifty-five crankshafts per hour are turned on the fastest crank-turning equipment yet developed. Five main bearings, flange and pilot, sprocket diameter and front end turned simultaneously. Transfer is automatic.

**NEW LeBlond-Carlstedt Rapid Borer**

Entirely new concept in high production of deep holes. Designed expressly to accommodate the new boring method and tooling developed in Europe. Don't miss this demonstration — *see holes bored 3 to 8 times faster than ever before!*

***. . . cut with confidence***

**THE R. K. LEBLOND MACHINE TOOL COMPANY**

**CINCINNATI 8, OHIO**

LeBLOND of Cincinnati

*World's Largest Builder of a Complete Line of Lathes . . . For More than 68 Years*

**Turn the page for a preview**

Litho in U.S.A.

**FACTORY / EQUIPMENT NEWS**
*Begins on page 136*

For more about these products, circle item numbers on Reader Service card next to back cover.

**45—Fire Extinguisher System,** using pressure-operated, carbon dioxide units permits one set of cylinders to guard number of areas. Detects fire, selects number of cylinders needed, actuates them, routes smothering agent to "in-trouble" area. *Walter Kidde & Co.*

**46—Transformers** for distribution and power to 1000 kva. are oil-immersed, self-cooled units. Sturdy tanks eliminate possibility of oil leaks. They're electrically welded in a special manner and reinforced with external and internal ribs. *Marcus Transformer Co.*

**47—Germicide - Deodorizer** has a pleasant fragrance — smells like meadow mint. "Mintol" dilutes economically, too—1-100 parts water for disinfecting; 1-200 for deodorizing. Use it freely wherever bacteria menace or odors offend. *C. B. Dolge Co.*

**48—Heat Treating Baskets** are designed to allow for thermal expansion and contraction. Non-binding joints employ tubular rivets and loosely fitting spacer sleeves. Provide free movement of all joints during heating and cooling. *Cambridge Wire Cloth Co.*

*Turn the page*



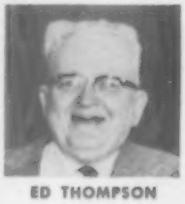
THE CYCLEMASTER
UDYLITE'S NEW AUTOMATIC PLATING MACHINE
OFFERS • HIGHER PRODUCTION
PERMITS • GREATER VARIETY OF PROCESSES
USES • MINIMUM FLOOR SPACE
WATCH FOR IT!
COMING SOON!!
THE Udylite CORPORATION
DETROIT 11, MICHIGAN

Scrubbing Italian Marble floor in 3M Company reception room. Flooring in other rooms is gray asphalt tile

# 3M Company picks MULTI-CLEAN floor maintenance equipment

When Minnesota Mining and Manufacturing Company erected its new Central Research Laboratory, it selected a MULTI-CLEAN MCV-220 Industrial Vacuum Cleaner, MCS-16 Scrubbing Machine and MC-19 Floor Machine to keep the building's 90,000 square feet of floor area bright and clean.

"We've used MULTI-CLEAN floor equipment for the past 8 years," says Ed Thompson, 3M Superintendent of Janitorial Services. "We now have 3 vacs and 12 machines on the job in our St. Paul building. With MULTI-CLEAN equipment, it takes 5 of our men only 1½ to 2 hours a night to scrub, wax, and polish up to 5,000 square feet of floor. We figure our MULTI-CLEAN machines and vacs *have cut our floor maintenance time by two-thirds* and we have nice looking floors all the time."



ED THOMPSON

MULTI-CLEAN PRODUCTS, INC.
2277 Ford Parkway, St. Paul 1, Minn., Dept. FM-85

Gentlemen: Send floor maintenance information on:
☐ Concrete, ☐ Asphalt Tile, ☐ Terrazzo, ☐ Wood, or ☐ _____. Also literature on: ☐ Floor Maintenance Equipment.

Name _____

Firm _____

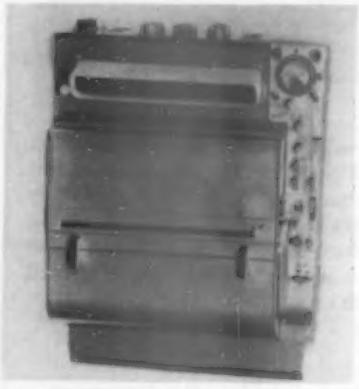
Address _____

City _____ Zone ____ State _____

**FACTORY / EQUIPMENT NEWS**
*Begins on page 136*

For more about these products, circle item numbers on Reader Service card next to back cover.

**49—Pump Control Switch** has a reverse action device. For applications requiring protection on loss of pressure, or to initiate cycle of operation on rising pressure. Operates at pressures to 80 psi. Differential variable from 10-30 psi. *Square D Co.*



**50—Recording Oscillograph** has all operating controls centralized on front panel. Designed to simplify internal adjustments. 48 steps and 24 separate speeds by manual changing of gears. Two models in Series 700 C. *Minneapolis-Honeywell Regulator Co.*

**51—Tap Changer** is for regulators above 1500 kva. Changes taps under load to provide plus or minus 10% regulation in ⅝% steps. Self-contained, with two separate oil-filled compartments for selector and transfer switches. *Westinghouse Electric Corp.*

*Turn the page*

**JENKINS PLUG TYPE VALVES**
with the
**500 BRINELL**
STAINLESS STEEL
ARMOR SEAT
will
lower costs

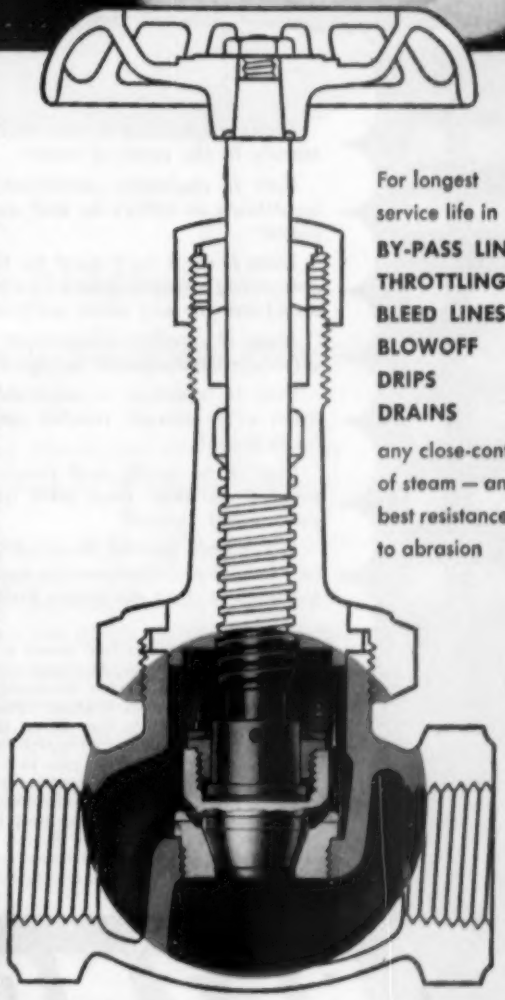
Closely regulated steam erodes grooves in seating units and drastically cuts service life of ordinary valves.

Jenkins Plug Type Valves have been engineered in every detail for maximum wear in such valve-killing service. The stainless steel Armor Seat defies the "vapor drill", and Jenkins quality throughout gives them top rating for wear-proof and trouble-proof perfomance.

Make you own test . . . in your toughest steam service . . . or anywhere that abrasion or erosion causes frequent valve failure. Compare, part for part, with any similar valve. You'll find that, again, Jenkins *extra value* pays off in longer life and lower maintenance cost.

Plug and seat ring are Jenkins JX500, a Stainless chromium alloy steel made to Jenkins high strength specifications, heat-treated to 500 Brinell. Seating surfaces are super-hard and mirror-smooth, offer highest resistance to galling, cutting, abrasion, and erosion. Wide, steep, 30° total taper permits extremely close regulation of flow and vapor-tight closure.

The Stainless steel plug is securely fastened to the spindle with a bronze locknut. Spindle is aluminum bronze with a tensile strength exceeding 70,000 lbs., — has high corrosion resistance.



For longest service life in
**BY-PASS LINES**
**THROTTLING**
**BLEED LINES**
**BLOWOFF**
**DRIPS**
**DRAINS**
any close-control of steam — and for best resistance to abrasion

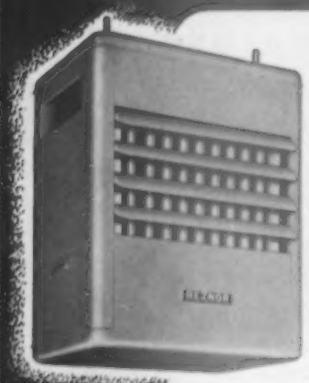
**300 lb. 200 lb. 150 lb.**
**GLOBE and ANGLE**

For complete information call your Jenkins Distributor — ask for Form 202. Or write: Jenkins Bros., 100 Park Ave., New York 17.

SOLD THROUGH PLUMBING-HEATING AND INDUSTRIAL DISTRIBUTORS

JENKINS VALVES
LOOK FOR THE JENKINS DIAMOND
SINCE 1864
JENKINS
Jenkins Bros.

# *Good* Heating Is Good for Production



The best production equipment, the most carefully planned production line can fail to pay off if unfavorable working conditions impair worker efficiency. Comfortable workers do n better job; good heating means increased production, fewer rejects. Poor heating means more errors, increased absenteeism.

Is your heating system as efficient as your production line? The check list below will give you the answer.

| YES | NO | |
|---|---|---|
| ■ | ■ | *Can your heating system deliver heat instantly to the point of need?* |
| ■ | ■ | *Can it maintain comfortable working conditions in offices as well as out in the plant?* |
| ■ | ■ | *Does it meet your need for heat without occupying a single square foot of space you could use for any other purpose?* |
| ■ | ■ | *Does it operate completely automatically — with absolutely no labor costs?* |
| ■ | ■ | *Can it maintain comfortable temperatures even around trouble spots such as large doors?* |
| ■ | ■ | *Can it be easily and economically expanded to keep pace with expansion of your plant layout?* |
| ■ | ■ | *When only part of the plant is operating, can it heat just the areas in use as economically as it does the entire building?* |

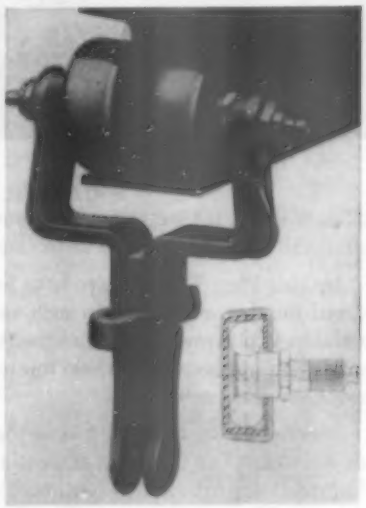
If you have to answer "no" to one or more of these questions, inefficient heating may be responsible for unnecessarily high production costs. Reznor suspended gas unit heaters, by giving you maximum heating efficiency, will increase your production efficiency, too. Often this can be done by installing Reznor units to supplement your present heating system. Or it may pay you to completely replace your present system with automatic Reznor heaters. And, of course, you'll want more information about the efficiency and economy of Reznor gas unit heating before you plan any new buildings. See the Reznor catalog in Sweets Plant Engineering or Industrial Construction Files or write for more information. You'll get action. Fast.

**REZNOR**
THE WORLD'S LARGEST-SELLING GAS UNIT **HEATERS**
Reznor Manufacturing Company, 67 Union Street, Mercer, Pa.


**FACTORY / EQUIPMENT NEWS**
*Begins on page 136*

For more about these products, circle item numbers on Reader Service card next to back cover.

**52—Drill Riveter** is an automatic unit that replaces hand riveting with quality machine fastments. Eliminates such human factors as radial cracks due to vibration fatigue. For use mainly in bench work and large fabricated components. *General Riveters, Inc.*



**53—Overhead Trolley,** medium-duty, open-track type, features lubrication fittings machined as part of roller shaft, rather than separately screwed in. Chain rolls on trolley instead of being pulled inside track, eliminating drag. *Rapistan-Keystone, Inc.*

**54—Control System** is for predetermined repeat or non-repeat machine cycle. Stored electrical energy is control principle employed by mechanical tripping mechanism. Standardized unit accommodates many different types of machines. *Security Controls, Inc.*

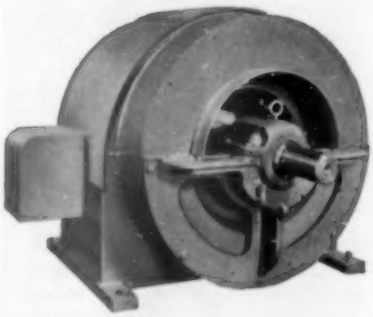
**55—Geared-Head Wrench** is for heavy assembly and disassembly work requiring rotary effort over 20 ft. lb. For use with ratchets, torque wrenches, sockets, and attachments. Ratio of 4:1 permits use as multiplier for torque wrenches. *Bonney Forge & Tool Works.*

*Turn the page*

All of the bars of this squirrel-cage rotor are being joined simultaneously to one end ring by the Westinghouse high-frequency brazing process. The end ring is heated by high-frequency currents induced by the coil on which it rests, and conduction carries heat to the bars. This process inspects itself . . . the red-hot bars are clear proof of positive joints.

## A big extra in large motors . . .

# Westinghouse special brazing process boosts rotor reliability, slashes maintenance



This is a large standard type CSF drip-proof motor. It can easily be modified to meet any special mechanical-drive requirement.

**High-frequency brazing eliminates rotor joint failure . . . proved on over 1500 motors operating up to five years without a single failure**

This technique licks the biggest single trouble spot in rotors of large motors. Bars are brazed to the end rings—and connections are tested at the same time. It is the only way to get solid, indestructible joints . . . your positive assurance of reliable operation under the toughest conditions.

**You get many important extras** in Westinghouse large motors. Thermalastic® insulation, for example, gives over 20% increase in dielectric strength, 10-to-1 increase in voltage endurance—withstands moisture, dust and corrosive atmospheres.

Both of these features have been extensively proved in service. They give you a motor far superior in performance and long life . . . the closest you can come to a completely maintenance-free mechanical drive. For full range of sizes and application assistance, call your local Westinghouse sales engineer, or write: Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-10444

YOU CAN BE **SURE**... IF IT'S

**Westinghouse**

# Saves $22,000 a year

## Planet Pusher-Bar Conveyor Pays for Itself in Eleven Months

At a leading automobile plant, loading scrap from trim presses on to railroad cars formerly required a two-man crane and magnet operation.

Now . . . two Planet conveyors move baled scrap to waiting railroad cars *automatically* . . . saving $22,000 a year!

The system, which now loads an average of 12 cars a day, is engineered to handle a maximum of 105 cars a day. The retractable conveyor permits easy movement of the railroad cars.

If your plant has a scrap handling problem, get in touch with a Planet Engineer. Whatever your plant layout, he'll show you an efficient, compact, and economical way to minimize your handling costs.

**PLANET**
**CORPORATION**
1814 SUNSET AVENUE
LANSING, MICHIGAN

- CONVEYORS
- ENGINEERED SYSTEMS
- FOUNDRY EQUIPMENT
- AUTOMATION
- STEEL FABRICATION

**FACTORY / EQUIPMENT NEWS**
*Begins on page 136*

For more about these products, circle item numbers on Reader Service card next to back cover.

**56—Vertical Motors** are hollow-shaft units designed for pumps. Lightweight cap can be lifted by one man for easy installation, inspection, and maintenance. Now available in ratings of 40 hp. and up; 7½ hp. and up early next year. *General Electric Co.*

**57—Valves** are offered in offset, angle, or in-line styles. All internal parts are romovable through bonnet. Parts for three types are interchangeable. Seal needs no lubrication or adjustment. Self-draining elminates frequent cleaning. Sizes: ½-6 in. *Hammel-Dahl Co.*

*Turn the page*

HALL LABORATORIES, INC.—A SUBSIDIARY OF HAGAN CORPORATION, PITTSBURGH, PENNSYLVANIA

# Hall Industrial Water Report

VOLUME 3 AUGUST 1955 NUMBER 4

## *It Takes a Lot of Water Conditioning To Operate a Steel Mill at Capacity Plus*

The constantly increasing production of steel demands a constantly increasing stream of raw materials. Water, used in many ways, is one of the most important. More than 100 tons of water go into the production of every ton of steel, underlining the importance of water engineering to the steel industry. Hall Laboratories, through close cooperation with plant personnel, serves the steel industry, whether in routine control of daily treatment, or in solving the many special problems peculiar to the steel industry.

### The Skid-Pipes Were Skidding

Difficulties with cooling water constitute the bulk of steel plant water problems. For example, in one steel plant, the water cooled skid-pipes on which billets are pushed through 2000°F reheating furnaces were buckling.

Investigation revealed that scale formation cut down heat transfer and caused the overheated pipes to fail. Threshold Treatment of the cooling water with Calgon® now keeps the skid-pipes free of scale, and the buckling of the pipes is no longer a problem.

### Discoloration of Galvanized Strip Checked

Hall engineer B. Q. Welder reports on solution of a problem in the galvanizing mill of a large steel mill in the "Iron City."

"Galvanized strip unaccountably developed large dark discolorations some weeks after shipment. It seemed to me that the source of the discoloration might be in the rinsing operation.

"Following galvanizing, the strip was rinsed by immersion in and spraying with filtered river water. The last step in the process was a chromate-silicate rinse prepared with clarified river water. Carryout of solids from the rinses was responsible for the trouble.

"Since adopting our recommendation that condensate be used for the rinse following the immersion tank and in making up the final chromate-silicate rinse there have been no further reports of trouble."

### Baffling Problem Solved

When the exchange capacity of a sodium zeolite softener in an eastern steel mill dropped to 8.2 kilograins per cubic foot from a rated capacity of 16 kilograins per cubic foot, plant personnel consulted their Hall engineer, D. E. Noll. To confirm his suspicion that hydraulic channeling of the resin bed was responsible for the loss of capacity, Noll tried an intermediate backwash to redistribute the resin. The backwash doubled the length of the run, indicating that channeling might be the trouble.

When operation permitted an inspection of the resin bed, Noll and the plant men found that although fissures had not broken through, high flow rates around the edges of the unit had pushed down the exchange material, and a cone had formed in the bed.

To step up the efficiency of the softeners, Noll suggested a baffle design that would insure even distribution of the incoming water throughout the exchange bed. When the units were returned to service with baffles installed, the exchange capacity came up to the rated 16 kilograins per cubic foot and normal regeneration practice was resumed.

---

Specialists in iron and steel metallurgy are skilled at transforming crude ore into finished metal. Like the technologists in steel, Hall Laboratories fits the treatment of a vital raw material, water, to the need in specific processes in the manufacture of steel.

### *New Control System Tested*

A new system of automatic blowdown control developed by Hall Laboratories' research has shown in field trials that it maintains boiler water solids concentration within plus or minus 5% of the set point.

The equipment continuously determines the dissolved solids concentration in boiler water by measuring the conductivity of a flowing sample. A signal from the conductivity cell pneumatically controls the blowdown valve.

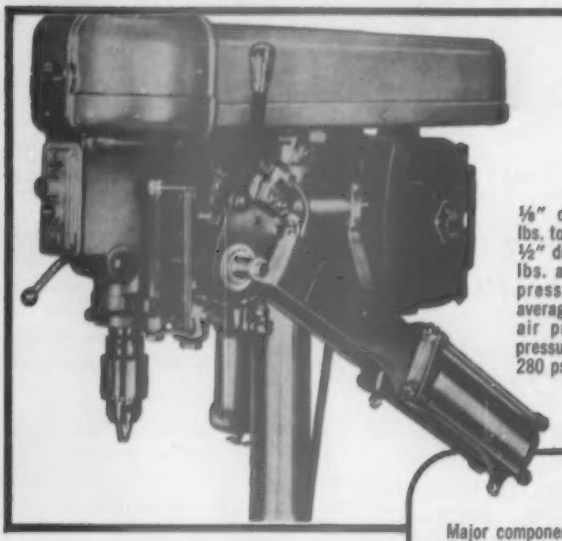
The new control system minimizes the possibility of carryover and allows close control of treatment under all conditions.

Booklet H-1, describing the Hagan Automatic Blowdown Control System, is available upon request.

### *Industrial Water Problems Require Special Handling*

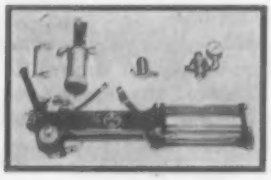
There are no "stock answers" to industrial water problems. For information, write, wire or call Hall Laboratories, Inc., Hagan Building, Pittsburgh 30, Pa.

*Water is your industry's most important raw material. Use it wisely.*



⅛" drill operates on 5 lbs. to 7 lbs. air pressure; ½" drill on 20 lbs. to 25 lbs. air pressure. Feed pressure at drill point averages 14x greater than air pressure, i. e. air pressure at 20 psi delivers 280 psi at drill point.

Major components of new W-T Air Feed. No "electrics". No "hydraulics". Installs in about 10 minutes, no machining necessary. Just connect to nearest air supply.



PAT. PENDING

new

walker-Turner

# AIR FEED DRILL PRESS

**Ingenious Air Feed gives you AUTOMATIC CYCLING FOR PRODUCTION DRILLING — AT LOWEST POSSIBLE COST!**

*What does it cost?* The W-T Air Feed Drill Press is available, ready for operation, at a surprisingly modest cost. For example: a W-T 15"-4" Travel Drill Press *complete with motor and Air Feed* is priced from $344.00. Or, if you prefer, you can get the Air Feed unit at only $185.50 to fit your W-T Drill Press (or any W-T type drill press up to 4" spindle travel). Compare these prices with any other Air Feed equipment!

*Profitable?* The W-T Air Feed is 100% pneumatic . . . requires virtually no maintenance . . . gives you fully dependable, low-cost, automatic performance day-in-and-day-out for a wide range of production operations, including drilling, reaming, counterboring, tapping, burring, spot-facing, etc. Fits as integral part of a drill press head, does not interfere with any function, swing or position of the machine.

*Accurate?* Complete, sensitive air feed control—including checking and slowing-down at several points as well as at the break-through point—is accomplished by ingenious, fool-proof micro-valve action. Just by positioning a valve stop, the spindle will feed and retard as desired, continuously and automatically—and the accuracy of the stroke will hold indefinitely within 0.003".

*Available?* Your local Distributor has W-T Drill Presses equipped with W-T Air Feed on demonstration right now. See them in action. You'll find your Walker-Turner Distributor listed under "Tools" in the yellow pages of your local telephone directory. Call him, today.

WALKER-TURNER

• DIVISION •

KEARNEY AND TRECKER CORPORATION

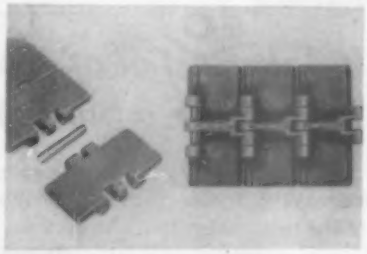
PLAINFIELD, N. J.

DRILL PRESSES—Hand and Power Feed • AIR FEED DRILL PRESS ATTACHMENT • RADIAL DRILLS • Wood and Metal Cutting BAND SAWS • TILTING ARBOR SAWS RADIAL SAWS • JIG SAWS • LATHES • SPINDLE SHAPERS • JOINTERS BELT AND DISC SURFACERS • FLEXIBLE SHAFT MACHINES


## FACTORY / EQUIPMENT NEWS

*Begins on page 136*

For more about these products, circle item numbers on Reader Service card next to back cover.



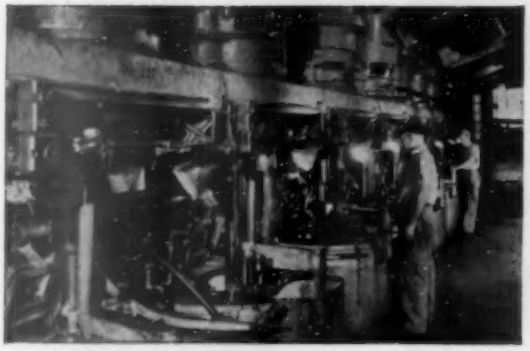
**58—Nylon Conveyor Chain,** flat-top type, operates without lubrication, has a smooth surface, is lightweight. Particularly suitable for conveying food, pharmaceuticals; for filling and packaging machinery. Links joined by stainless-steel pins. *Chain Belt Co.*

**59—Cement Lining** restores corroded water heaters and tanks. Just apply with a trowel to ½-in. thickness, even over rusted areas. C-17 Pre-Krete sets in a few hours. Will not shrink or crack; withstands high temperatures. 95-lb. bags. *Pocono Fabricators, Inc.*

**60—Power Sweeper** has no dust bag to empty. Easy to maneuver. Sweeps close to walls and equipment without bumping or snagging. Models 60-5 and 60-6 have range of sweeping paths of 36-68 in. with two side brooms; cover 100,000 sq. ft. per hr. *Wayne Mfg. Co.*

**61—Roof Coating** is compounded of three weather-protectors: aluminum, asbestos, asphalt. Result is durable, resilient coating, immune to chipping, peeling, sun-damage. Permite 3-A protects all roofing except wood. 1-qt. to 55-gal. drums. *Aluminum Industries, Inc.*

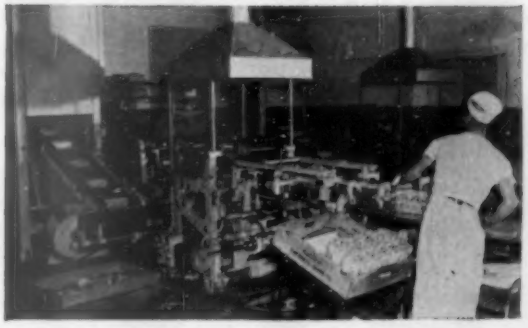
*Turn the page*



***Protecting syrup against carmelizing** at American Molasses Co. is the responsibility of Honeywell temperature and pressure controllers working with a **Modutrol** valve. The controllers are interlocked so that burning in the heater is prevented, and product quality is safeguarded.*

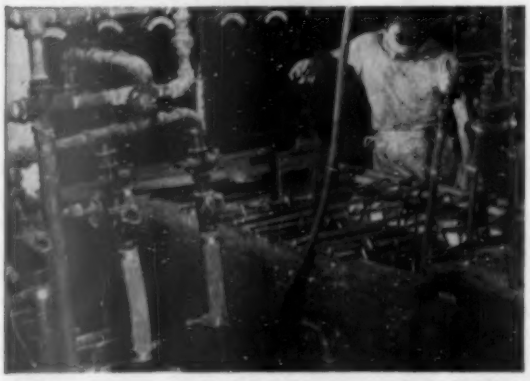
**Honeywell Controller Cost—$215.00**

# Honeywell Industrial Controls



***Air-conditioning bread as it cools** helps the Continental Baking Co., Portland, Oregon, to protect palatability. Honeywell Proportioning Temperature Controllers and Humidistat regulate sprays and air dampers to keep conditions right.*

**Honeywell Controller Cost—$50.00**



***Plating solutions** are held at correct temperature for best quality of finished electrotypes, at the Kingsboro Electrotype Corp., Brooklyn, N. Y. . . . by means of Honeywell Remote Bulb Controllers.*

**Honeywell Controller Cost—$29.00**

## *improve quality*

**Don't overlook these simple, low-cost controllers...they're the ideal solution to hundreds of problems.**

IN PRACTICALLY any plant, there are dozens of spots where simple, inexpensive Honeywell Industrial Controls can be put to work to improve the quality of production. The examples pictured here give only a few of the ways that this versatile family of controls can regulate temperature, pressure, vacuum, liquid level and humidity . . . the variables that directly affect quality of finished goods.

For your specific application, you can choose from more than 7000 different models in the Honeywell Industrial Controls line. All are simple in design, rugged in construction, modest in price. All are backed by the precision manufacturing know-how and extensive application experience of the world's largest manufacturer of controls. In addition to improving quality, these controls can also be relied on to increase production, reduce maintenance, increase safety and cut costs.

Ask your local Honeywell sales engineer to discuss how you can apply these controls in your own plant. Call him today . . . he's as near as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, Wayne and Windrim Avenues, Philadelphia 44, Pa.—in Canada, Toronto 17, Ontario.

*Also manufacturers of a complete line of precision measuring, recording and controlling instruments.*

MINNEAPOLIS
**Honeywell**
BROWN INSTRUMENTS
*First in Controls*

# Dust got their goat at Amalgamated!

**Pangborn rids plant of goatskin dust, gets higher production at lower cost.**

Processing 25,000 goatskins daily created a serious dust problem for Amalgamated Leather Co., Wilmington, Del. Dust was so thick during the buffing operation that workers had to stop every half hour to clean up. Pangborn Dust Control solved this problem. The atmosphere during buffing is now clean. Workers do better, *continuous* work. Plant and machinery maintenance costs are lower. No wonder Amalgamated says Pangborn is "really doing a job"!

Pangborn can solve *your* dust problem. Pangborn engineers will be glad to show you how Pangborn Dry or Wet Dust Collectors can save you time, trouble and money!

See how Pangborn benefits varied industries. Write for free copy of "Out of the Realm of Dust." Pangborn Corp., 2100 Pangborn Blvd., Hagerstown, Maryland.

**Pangborn**
**CONTROLS DUST**


**FACTORY / EQUIPMENT NEWS**

*Begins on page 136*

For more about these products, circle item numbers on Reader Service card next to back cover.

**62—Current Transformers** are for indoor service in operation of relays and control devices. Have extra-high mechanical and thermal ratings. Type JKS-3 for 5000 volts, line-to-line. Made in standard, single, primary-current ratings of 15-800 amp. *General Electric Co.*

**63—Sandpaper** is for wet or dry sanding, hand or machine. Cloth mesh is coated with aluminum oxide or silicon carbide, bonded with heat-resistant, waterproof resin. Resists filling and loading. Coarse to fine grits; rolls, discs, sheets. *Minnesota Mining & Mfg. Co.*

**64—Fluorescent Fixtures** are for use on tasks requiring good eyesight—where quality lighting is important. Semi-Direct line provides minimum efficiency of 82%, upward light component of 25%. 4- and 8-ft. lengths; rapid or instant start to suit your needs. *Sylvania Electric Products, Inc.*

**65—Alarm Contact Tachometer** not only indicates machine speeds, but controls machine speeds, signals and warns visually and audibly if machine jams. Model SA-6 can also open and close valves, stop or start machinery at pre-set speeds. *Herman H. Sticht Co.*

*Turn the page*

# NEW
## Automation in Drilling at Low Cost

# ARO

**AUTOMATIC and PAR-A-MATIC DRILLS**

Increased production . . . higher quality . . . fewer man hours! Controlled air and hydraulic feed . . . rapid traverse adjustment . . . adjustable stroke length . . . use singly or in combinations. Write for bulletin 5546-T on Automatic and Par-A-Matic Drills.

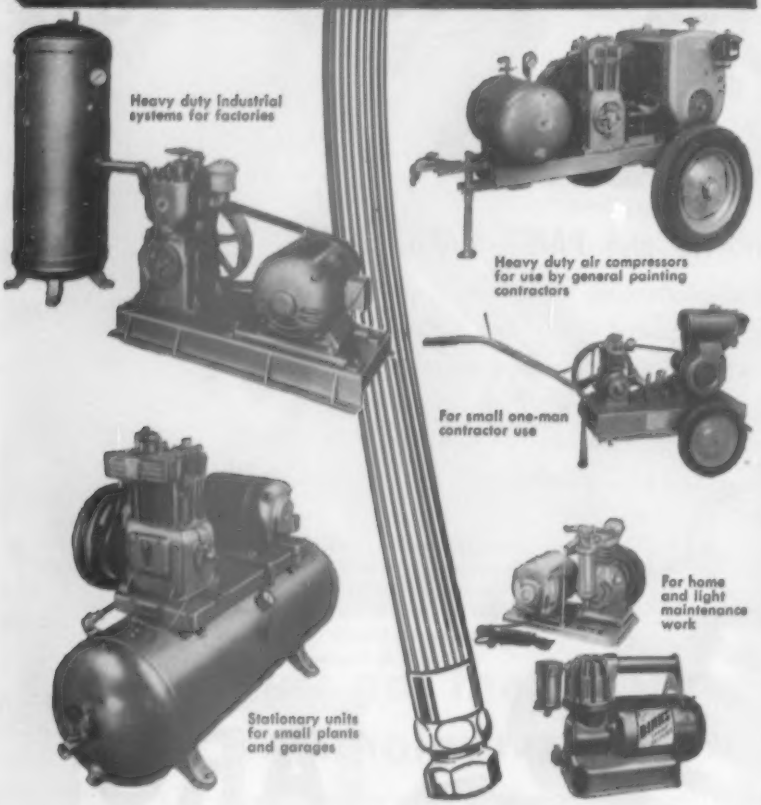
**THE ARO EQUIPMENT CORPORATION**
**Bryan and Cleveland, Ohio**
Aro Equipment of California, Los Angeles, Calif.
Aro Equipment of Canada, Ltd.,
Toronto 15, Ontario
*Offices in All Principal Cities*

**ARO**

**AIR TOOLS**

Also . . . Air Hoists . . . Lubricating Equipment . . . Aircraft Products . . . Grease Fittings

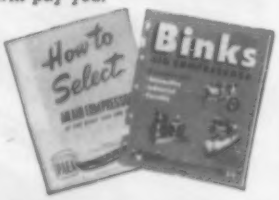
# Binks Complete Line offers you
## *the right size and type of*
# AIR COMPRESSOR
## to meet your special needs


Heavy duty industrial systems for factories
Heavy duty air compressors for use by general painting contractors
For small one-man contractor use
For home and light maintenance work
Stationary units for small plants and garages

**For each job there is an air compressor that is just right...one that gives you the volume and pressures you need with maximum flexibility and economy. The Binks Line of air compressors gives you a choice of 50 models from compact ¼ h.p. portable units to almost any size you need...each designed to do a specific job or to fit into a given air supply system. Before you buy or specify a new compressor, investigate the Binks Line...it will pay you!**

***To be sure you get the right compressor***

Ask your distributor or write direct to us for copies of **HOW TO SELECT AN AIR COMPRESSOR** and **BINKS CATALOG 810.** They will tell you what to look for in an air compressor and show you available models, accessories, etc. No obligation.




**Binks**
*EVERYTHING FOR SPRAY PAINTING*

**Binks Manufacturing Company**
3114-34 West Carroll Ave., Chicago 12, Illinois

110-66
REPRESENTATIVES IN PRINCIPAL U. S. & CANADIAN CITIES • SEE YOUR CLASSIFIED DIRECTORY


**FACTORY / EQUIPMENT NEWS**

*Begins on page 136*

For more about these products, circle item numbers on Reader Service card next to back cover.

**66—Aluminized Pipe Jacketing** resists fire, acid, water. Made of aluminum foil laminated onto vapor-proofed asbestos cloth. "Asbeston" requires no painting, cleans easily, does not absorb odors. It's half the weight of asbestos jacketing. *U. S. Rubber Co.*

**67—Wet-Dry Vacuum Cleaner** glides over carpet edges and sills; climbs ramps and stairs without lifting. Neoprene accordion hose stretches 6-16 ft. Caboose carries tools and attachments. Three models: 1½ bu. to 1¾ bu. *Pullman Vacuum Cleaner Corp.*

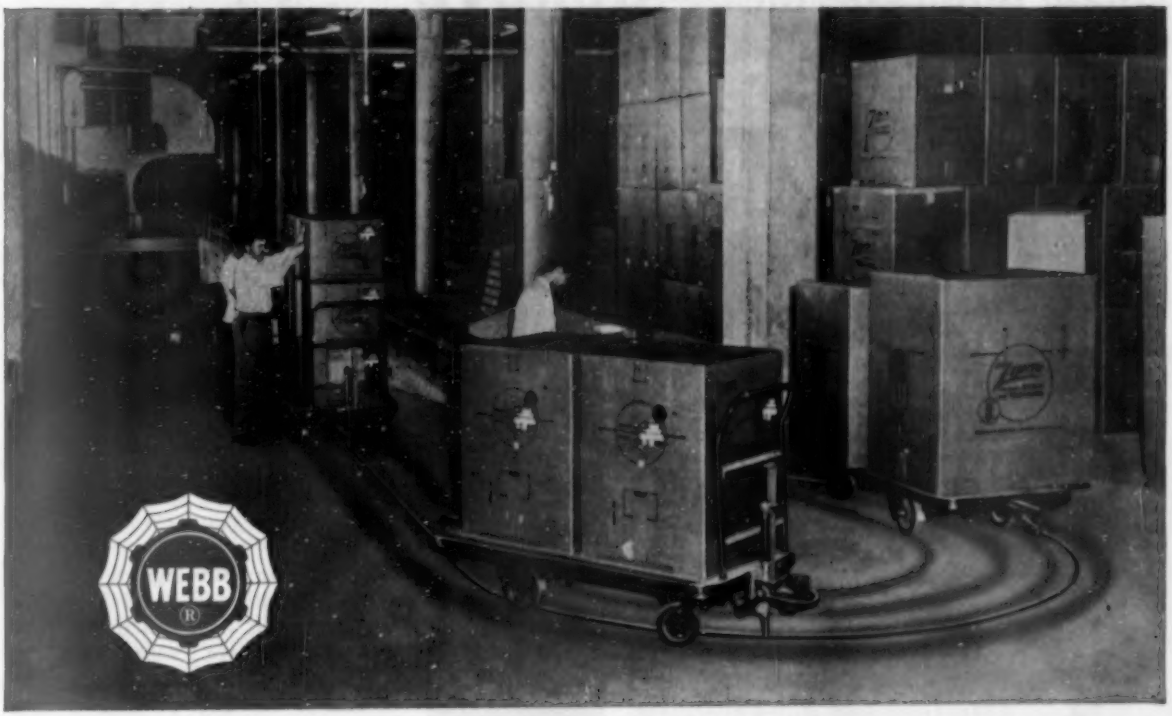
**68—Plastic Fittings and Adapters** (polyvinyl chloride) are for connecting small-diameter polyethylene and other flexible tubing. For tubing-to-tubing and tubing-to-pipe connections in ¼- and ⅜-in. range. No tools required to connect components. *S. & C. Mfg. Co.*

**69—Built-Up Roofs,** "Aquadam" type, for decks varying from dead level to low inclines of ½ in. per ft., have new specifications. Call for special cementing agent. With asbestos felts, will be smooth-surfaced; with rag felts, gravel-surfaced. *Johns-Manville Corp.*

*Turn the page*

# JERVIS B. WEBB

CONVEYOR ENGINEERING, MANUFACTURE, INSTALLATION and AUTOMATION




## A TOWVEYOR THAT RUNS FROM FLOOR TO FLOOR?

Yes, for the first time, here is a Towveyor installation that also travels up and down concrete ramps, providing a smooth and constant flow of materials between floors. This modern Towveyor installation is the backbone of materials handling in this huge plant. Nearly 4,000 feet of Towveyor track winds its way through the various departments, bringing cabinets and other materials in, and removing finished TV sets to storage or shipping.

The Towveyor system consists of a motor driven endless chain that travels in a trough in the floor. Material is carried on 750 tow trucks. Each truck is equipped with a tow pin which is manually lowered into a narrow continuous slot in the floor to engage the Towveyor chain. Trucks are disengaged from chain by raising tow pin. Tow pin is spring locked in the up position and locked in a slot in the down position for positive safety on both flat and ramp travel of tow trucks.

This efficient Towveyor system provides faster and better regulated flow of cabinets from receiving docks to warehouse. Finished radios and television sets are smoothly moved from final assembly to shipping. Picture tubes, component parts and even corrugated cartons are carried in a carefully coordinated manner to their proper stations. Maximum daily capacity of system is 10,000 cabinets delivered to warehouse and 10,000 finished sets to shipping.

Webb engineering ingenuity and design experience can also provide a better answer to your materials handling problems. Up and down, and all around your plant, Webb conveyors engineered to your specific needs are best.

Visit us at "The Production Engineering Show" — Navy Pier, Chicago • September 6 to 16, 1955 • Booth 518

Write to us on your company letterhead and we will be happy to place your name on the Webb mailing list to receive factual technical information on conveyor installations, case history reports, and new product literature.

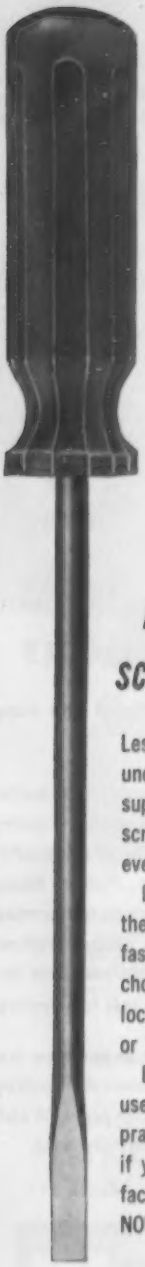
## JERVIS B. WEBB CO.

*Specialists in Custom Conveyor Systems*

8939 ALPINE AVENUE • DETROIT 4, MICHIGAN

*Offices and Representatives Throughout The World* • FACTORIES: *Detroit* • *Los Angeles* • *Hamilton, Ontario*

# Keep your eye on Buckeye



hand tool size

air tool power

*these*

## NEW "L" SERIES

***Reversible and Non-Reversible***

***SCREWDRIVERS and NUT RUNNERS***

Less than 9 inches long . . . weighing well under 2 pounds . . . requiring only a limited air supply . . . these NEW Buckeye L Series screwdrivers and nutrunners are miniature in every respect—except power.

Into these pocket-size tools is packed all the quiet air power you'll ever need for any fastening job within tool capacity. You can choose adjustable or positive clutch . . . lever, lock button or offset handle . . . in 3,000 or 1,800 RPM speeds.

Designed and built for full-scale production use, Buckeye L Series tools make power tools practical for any fastening operation, even if you use them only intermittently. All the facts will be found in Catalog G-10—Write NOW for your copy.

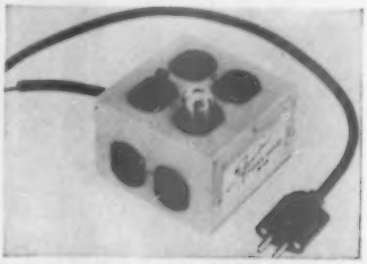
**Buckeye Tools**
CORPORATION
DIVISION 13 • DAYTON 1, OHIO
*IN CANADA: Joy Manufacturing Co., Ltd., Galt, Ontario*

producers of the world's first successful rotary air tools


**FACTORY / EQUIPMENT NEWS**

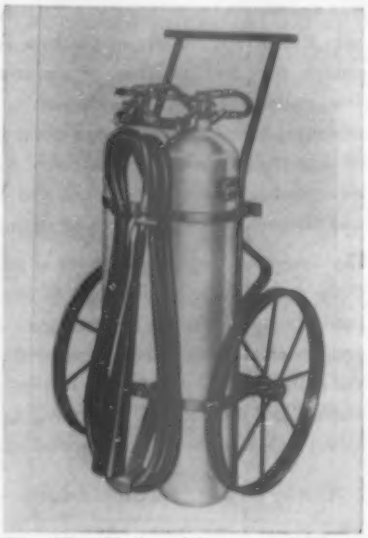
*Begins on page 136*

For more about these products, circle item numbers on Reader Service card next to back cover.



**70—Multiple Outlet Box,** portable, is for testing, for electric hand tools at remote locations—any place you need up to six outlets. Both sides of line are fused, to protect against shorts or excessive loads. "Safe-corde" operates on 115/230 volts a-c or d-c. *Kenru Co.*

**71—Nylon Fastenings** are self-locking, non-corrosive, and insulating. Weighs less than half as much as aluminum; have tensile strengths to 15,700 psi.; withstand continuous heat to 300 deg. F. Screws, nuts, and bolts in many types and sizes. *Nylogrip Products.*



**72—Fire Extinguisher** on wheels is carbon-dioxide type. Cylinder engine is capped by lever-operated valve which permits immediate discharge. 50-, 75-, and 100-lb. capacity models. Twin 50-lb. cylinders can be operated independently or in tandem. *Fyr-Fyter Co.*

*Turn the page*

# ORE . . . enriched by man

## Extends Nation's Iron Reserves for Generations to Come!

Going, going . . . almost gone are many of the great deposits of ready-to-use iron ore that have fed U. S. steel mills for almost a century.

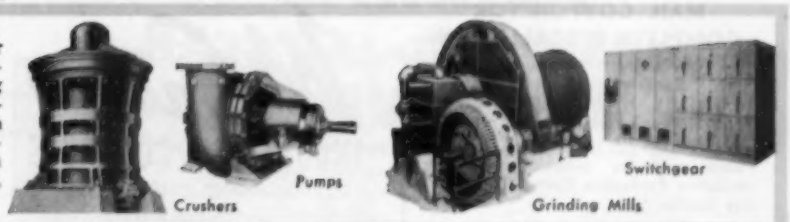
But from vast reserves of TACONITE rock — long considered too low in iron content to be worth using — a new and rich blast furnace feed is being made.

First, flint-hard taconite is crushed and ground to powder. Magnets separate iron-rich particles from the waste. These particles then must be combined into a hard, usable form. Allis-Chalmers has pioneered several methods of accomplishing this. One of these — the nodulizing method — uses the rotary kiln shown here.

The white heat of this kiln produces nodules of 65% iron content—a far richer, better furnace feed than the best shipping grade ores from the Mesabi iron range!

## Allis-Chalmers Machinery Plays a Part

The world's largest gyratory crusher was built by Allis-Chalmers for taconite reduction. Allis-Chalmers grinding mills, screens, pumps, motors and electric power equipment are all used in the process. For facts about A-C equipment, call the A-C representative in your area, or write Allis-Chalmers, Milwaukee 1, Wisconsin.




A-4690

# ALLIS-CHALMERS

*McCaskey Control of Work-in-Process used by Strom Steel Ball Co., Cicero, Illinois, largest independent manufacturer of steel balls.*

*McCaskey Inventory Control of finished stock.*

## McCASKEY Systems control PRODUCTION and INVENTORY with minimum clerical work for STROM STEEL BALL CO.

Strom controls work-in-process and finished stock with two McCaskey installations, briefly described by Kenneth E. Swanson, Industrial Engineer.

The first gives the Production Manager ***at a glance*** all the facts he needs to control production and process inventory of hundreds of types and sizes of steel balls by size and departments. Among them are:

(a) units produced by each department against schedule;
(b) location and amount of all process inventory;
(c) sizes or departments behind schedule, requiring corrective action;
(d) bottlenecks, if any, in flow of production;
(e) inventory banks to be increased or decreased.

McCaskey Inventory Control of all material in finished goods stock replaced a machine-posted system several months ago. The Sales Department must have dependable data on units available at all times to make definite commitments for shipments from stock. McCaskey provides this accurate, ***up-to-date*** information.

McCaskey Controls quickly return their first cost in improved operations, time and effort saving. They require a minimum of clerical work.

**MAIL COUPON FOR COMPLETE INFORMATION**

Victor Adding Machine Co.
McCASKEY INDUSTRIAL DIVISION
3900 N. Rockwell Street
Chicago 18, Ill.

Please send me complete facts on: McCaskey Production Control ☐; Inventory Control ☐.

Name.....

Position.....

Company.....

Address..... FMM-8-55

McCaskey
INDUSTRIAL CONTROLS
TOOLS - PRODUCTION - COSTS
MAINTENANCE - INVENTORY
*Victor Adding Machine Co.,*
McCASKEY INDUSTRIAL DIVISION
3900 N. Rockwell Street, Chicago 18, Ill.
Galt, Ontario, Canada





*Begins on page 136*


For more about these products, circle item numbers on Reader Service card next to back cover.

**73—Electronic Timer** for controlling repeat-cycle operations is self-recycling. Automatically produces a repetitive series of circuit closures. Time between adjustable from 0.03-24 seconds. Model S44 requires no warm-up, no power when off cycle. *Farmer Electric Co.*

**74—Ultrasonic Pickling,** descaling, and electroplating is faster and better with use of stainless steel, hermetically sealed "Sonicells," which can be immersed in corrosive or conductive liquids. Enables greater process use of transducers. *General Ultrasonics Co.*

**75—Paper Sampler** is a device which snatches a sample from any position on a moving web without tearing the web, and causing a shutdown. Sample can be put in testing bottle within five seconds, before any moisture is lost. Safe and easy to operate. *Moore & White Co.*


*Turn the page*

# RUGGED?

## 10 hp CARRIER CONVEYOR Moves 84,000 Foot-Tons Per Day!

THERE'S almost no limit to how rugged a Carrier Natural-Frequency Conveyor can get. Nor to what "impossible" jobs it can do. That's because Carrier Conveyors operate according to the laws of Natural Frequency and the application of this scientific principle was pioneered exclusively by Carrier.

**NATURAL FREQUENCY:** Carrier Natural-Frequency Conveyors substitute the natural resonant action of springs for brute force — thus UTILIZING the tremendous force of periodic vibration which, before Carrier, was considered a liability. Most of the power needed to operate Carrier Natural-Frequency Conveyors is repeatedly stored up in the springs, and returned on every stroke. The result — *much less power required . . . far less maintenance . . . far less down-time!*

Carrier Natural-Frequency Conveyors are now delivering incomparably efficient, trouble-free performance for many of America's biggest industrials. Mail the coupon, *today*, for all the facts.

### 150 Tons Per Hour Of Foundry Sand Handled With 10 hp!

Handling up to 150 tons per hour of foundry sand — including occasional sprues and tramp iron — is a rough, tough job. But it's a *cinch* for this 70-foot Carrier Natural-Frequency Conveyor! This big Heavy-Duty unit has a ⅜" steel-plate pan, 36" wide, and is powered by one 10 hp drive. Vibrated weight is approximately three tons. More than 50 giant coil springs are used. Full details gladly sent on request.

### *CARRIER ADVANTAGES*

**HIGH CONVEYING SPEED**
(Up to 100 feet per minute)

**GREATER CAPACITY**
(Up to 200 tons per hour)

**LESS POWER REQUIRED**
(About one-third as much as "competitive" equipment)

**LESS MAINTENANCE & DOWN-TIME**
(Less power + good design = trouble-free performance)

**NO DAMPENING UNDER LOAD**
(Designed with extra power for specified load, with positive stroke)

**SELF-CLEANING**
(Continuous, smooth trough — no pockets)

**COMBINES PROCESSING WITH CONVEYING**
(Can screen, dry, cool, dewater, blend, etc.)

**WIDTHS FROM 6" TO 48"—LENGTHS FROM 5' TO 250'**
(With pans 16 ga to ½" plate, of any metal, open or enclosed)

**BALANCED, VIBRATION-FREE UNITS AVAILABLE**
(For use on ceilings or light floor construction)

# CARRIER
# ~~NATURAL-FREQUENCY~~ CONVEYORS

Carrier Conveyor Corporation
221 N. Jackson St., Louisville 6, Kentucky

Gentlemen: Without obligation, please send me Carrier Natural-Frequency Conveyor Bulletin No. 111.

Firm_____

Street_____

City_____ State_____

Att. Mr._____ Dept._____

# IS THIS V-AMP-IRE BLEEDING YOUR POWER SUPPLY?

The V-amp-ire preys on plants that neglect proper lighting and drains off productivity as well as current faster than you can say "bat". To keep him out, light up with efficient, long-lasting CHAMPION Lamps and follow the practical practises outlined in the Champion Maintenance Manual.*

CHAMPION Lamps

*We'll be glad to send you a complimentary copy.

**CHAMPION LAMP WORKS**

308 Lynnway, Lynn, Massachusetts


**FACTORY / EQUIPMENT NEWS**

*Begins on page 136*

For more about these products, circle item numbers on Reader Service card next to back cover.

**76—Switchgear,** metal-enclosed, is safe and compact. Can be tested with compartment doors closed. Escutcheon and visual indicator are extendable through door. Available in 3-high frame arrangement. For 600 volts and below, 3000 amp. *I-T-E Circuit Breaker Co.*

**77—Torque Limiting Coupling** controls and fixes maximum torque transmitted from a driver to driven machine. Permits free wheeling or slip effect between driving and driven halves of coupling beyond limit. Adjustable from 50-150% of nominal rating. *Techniflex Corp.*

**78—Sump Pump** is self-priming. Can be located high and dry above the pit. Handles flood problems easily. Only suction line and strainer guard are in the sump. Pipes and control wire may be hidden in floor and wall; pump remotely located. *Gorman-Rupp Co.*

*Turn the page*

**TO THE FASTENER BUYER:**

Lamson & Sessions has manufactured Aluminum fasteners for the aircraft industry for many years. Therefore their experience with aluminum goes back a long ways. Now, however, Lamson has added to its aluminum line standard fasteners from stock.

- **FAST DELIVERY**
- **COMPETITIVELY PRICED**
- **FULL RANGE OF TYPES & SIZES**

***Here's good news for users of aluminum fasteners.***

Lamson & Sessions has now added "standard" bolts, nuts, screws and cotters of aluminum alloy to its famous full line of fasteners.

Henceforth the products illustrated above will be readily available. They come in a wide range of standard sizes, including machine screws down to No. 6 diameter by ¼" in length.

This means that users of aluminum bolts and nuts can now buy at competitive prices with the added advantages of fast delivery and service.

From now on it will pay you to insist on Lamson & Sessions aluminum fasteners—made by one of the world's largest fastener manufacturers.

Lamson & Sessions

**THE LAMSON & SESSIONS CO.**

1971 WEST 85th STREET • CLEVELAND 2, OHIO

*Plants at:* Cleveland and Kent, Ohio • Birmingham • Chicago

**LAMSON'S FASTENER EXPERIENCE IS NOW *YOURS* IN ALUMINUM**

## Get ALL the Advantages of Latex Flooring for Wearing Surfaces and Underlayments with Flintkote's PERMASETS*

As you know, thin mastics must have extra toughness and strength without being brittle. To withstand impact on flooring surfaces.

In addition, you want smooth evenness. Resilience. Traction. And comfort underfoot.

Use scientifically formulated Permaset Latex Binder Mastics to meet all these requirements *exactly*. Permaset Mastics provide unique properties not found in other flooring materials.

You can have mixes designed especially for underlayments. To make ideal leveling courses for preparing your floors for tile or other decorative covering.

And you can have mixes for finish floors, including terrazzo, in several colors. With high resistance to wear, as well as to various oils, greases, acids and alkalies.

*Reg. U. S. Pat. Off.

A gallon of the selected latex and a bag of the selected premix constitutes a unit mix. Use over wood, concrete or other firm base.

Send for data giving all the various formulations and directions for applying. Or ask a Flintkote Representative about special flooring problems.

Liquid latex is mixed with dry, premixed filler for the type of mastic and color you need. Result: a superior trowel-applied Latex Mastic... Permaset.

**FLINTKOTE**

THE FLINTKOTE COMPANY, *Industrial Products Division*, 30 Rockefeller Plaza, New York 20, N. Y.

BOSTON • CHICAGO HEIGHTS • DETROIT • LOS ANGELES • NEW ORLEANS • PHILADELPHIA

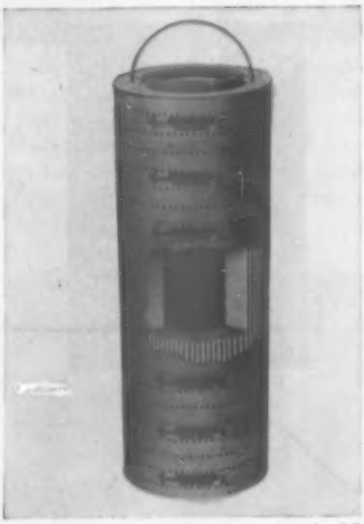
*In Toronto, Ontario:* The Flintkote Company of Canada, Ltd.
*In London, England:* Industrial Asphalts Company, Ltd.


**FACTORY / EQUIPMENT NEWS**

*Begins on page 136*

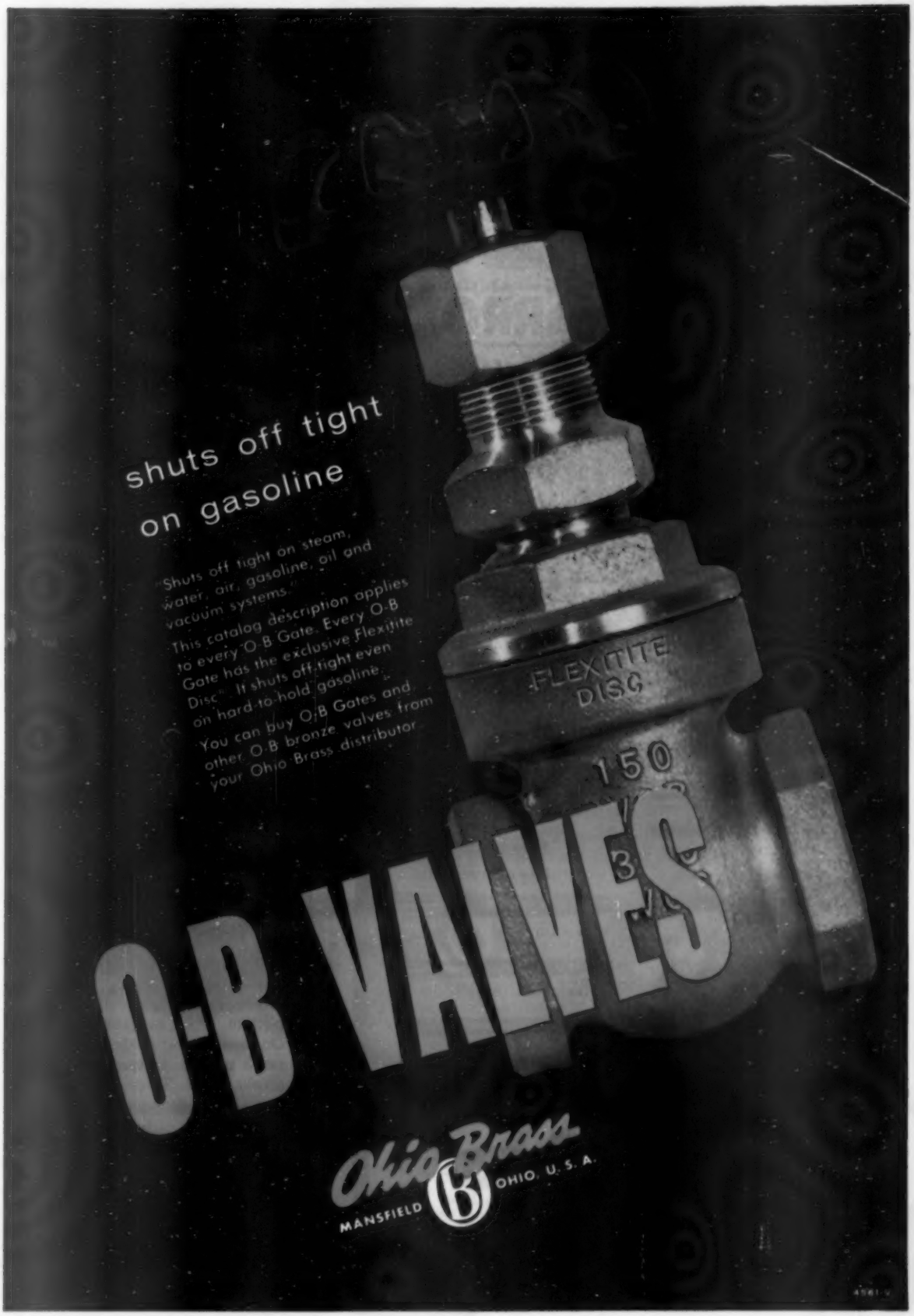
For more about these products, circle item numbers on Reader Service card next to back cover.

**79—Trolley Conveyor Wheel** is for 4-in. I-beams. It's grease lubricated and sealed against dirt. Runs smoothly and quietly with minimum friction, assuring maximum load capacity (rated at 600 lb.). Available with automatic lubricators. *Alvey-Ferguson Co.*



**80—Filter Cartridge** flow rate is 25 gpm. for 170 SUS oil; initial pressure drop only 1½ psi. 98% of particles 20 microns and larger are retained initially; smaller particles as accumulated solids increase efficiency of paper filter. *Houdaille-Hershey, Inc.*

*Turn the page*


shuts off tight
on gasoline
"Shuts off tight on steam, water, air, gasoline, oil and vacuum systems."
This catalog description applies to every O-B Gate. Every O-B Gate has the exclusive Flexitite Disc. It shuts off tight even on hard-to-hold gasoline.
You can buy O-B Gates and other O-B bronze valves from your Ohio Brass distributor
FLEXITITE
DISC
150
O-B VALVES
Ohio Brass
MANSFIELD
OHIO, U. S. A.

ARRO ARRO ARRO ARRO

EASILY INSTALLED
DEPENDABILITY
HOLDING POWER
QUALITY
SERVICE
UNIFORMITY

All Signs Point to...

TRADE ARRO MARK

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Always Specify ARRO

ARROFLUTE CARBIDE MASONRY DRILL
LAG SCREW EXPANSION SHIELD
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DOUBLE EXPANSION SHIELD
O-E EXPANSION SHIELD
MACHINE SCREW ANCHOR
STUD BOLT ANCHOR
LEAD SCREW ANCHOR
MAL-LEAD BOLT ANCHOR
TWO WING SPRING-TYPE TOGGLE BOLT
SPRING HEAD STEEL TOGGLE BOLT
RIVETED HEAD TOGGLE BOLT
LITTLE MAJOR TURNBUCKLE
FOUR-POINT HAND STAR DRILL
THREE-POINT DRILL POINT
FOUR-POINT DRILL POINT
TWIST DRILL POINT
RUBBERGRIP DRILL POINT HOLDER

See your industrial, hardware or electrical supplier

ARRO EXPANSION BOLT COMPANY
1420 Boone Ave., Marion, Ohio



*Begins on page 136*

For more about these products, circle item numbers on Reader Service card next to back cover.

**81—Portable Balancer** is especially useful for large parts. Compact, self-contained unit balances and vibration-analyzes parts that cannot be handled economically in a precision-type machine. Balances at speeds of 250 rpm. *Tinius Olsen Testing Machine Co.*

**82—Bucket Elevator** is for heavy-duty handling of metal parts to 1 lb. each. Use it for measured feeding of parts, heat-treating operations, removing stampings and forgings from presses, lifting parts to overhead conveyor, unloading filter presses. *M-H Standard Co.*

**83—Concrete Seal** protects old and new surfaces, indoors and out. Liquid applies easily with mop, brush, squeegee, or sheepskin applicator. Open to traffic in 4 hours. On new areas, holds moisture beneath surface, preventing deposit of alkaline salts. *Speco, Inc.*

**84—Pipe Insulation** is of fibrous glass and thermo-setting binder. Jacket is 5-ply laminate, including asphalted kraft paper and aluminum foil; 1- to 2½-in. thick. For –120 to 250 F. Pipe to 33 in.; copper tubing to 6 in. *Owens-Corning Fiberglas Corp.*

*Turn the page*

# SERVICE

**with a smile...**
**from Leland**

Leland Type RA, repulsion start, induction run, drip-proof, ball bearing, horizontal or vertical, integral HP.

Leland Type KL, capacitor start, induction run, drip-proof, sleeve bearing, resilient base, ¼ through 3 HP.

*Service* through any one of almost 200 Leland motor service stations, in all principal cities throughout the nation.

***A smile*** because records prove our customers seldom *need* these extensive service facilities!

From its very founding, Leland's proud policy has been to build motors that not merely meet, but *surpass* specifications . . . motors that will do the job they were intended to do, *and then some*, to give you years of trouble-free, *service-free* operation.

Yet for this very same reason—this policy of doing everything possible to assure customer satisfaction, Leland maintains an extensive, up-to-date motor service system to provide immediate, expert attention to your motor problems—whenever, *if ever*, they should arise.

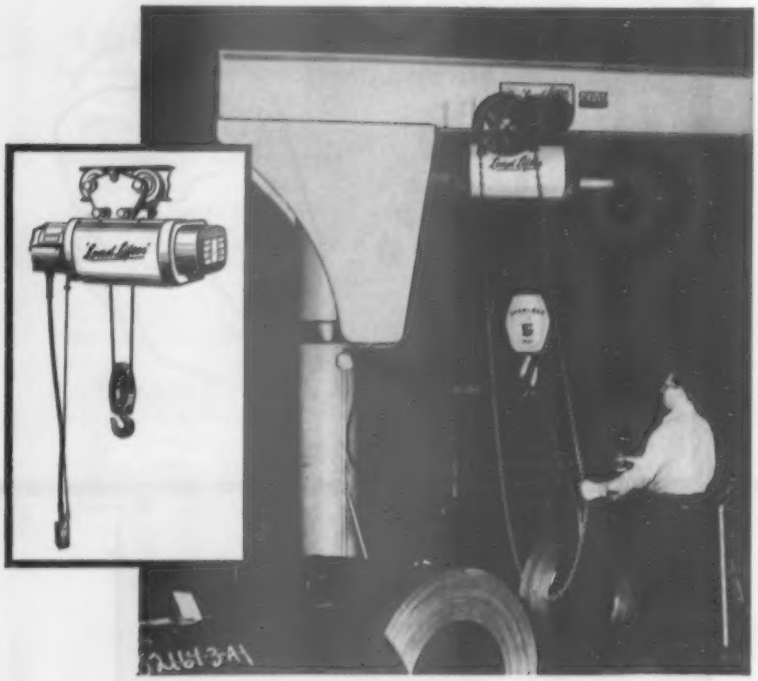
Next time you need motors you can *depend* on—a few, a hundred, or thousands—look to Leland. The extensive line of Leland motors ranges from ⅛ to 5 hp., including all popular types and frames.

Another AMF Product

**LELAND MOTORS**

Write
THE LELAND ELECTRIC COMPANY
Division of American Machine & Foundry Company
Dayton 1, Ohio

**Visit Leland at Booth 349,**
**Production Engineering Show, Navy Pier, Chicago**
**September 6-16**



## WANT LOWER COSTS? THEN USE THIS HOIST!

Step up load handling speed in your plant and save money doing it. Put the Series "700" 'Load Lifter' Electric Hoist to work. It shortens hoisting time—lifts a 1-ton load a foot in only 2 seconds! You get more lifts per hour.

The Series "700" 'Load Lifter' is a push-button work-saver, safety-engineered to protect man, load and hoist. Only 24 volts at the pendant control! The powerful load and motor brakes are synchronized; each alone can pull the full load. Steel suspension and overcapacity load hook, plus preformed nonrotating wire rope, provide super-strength.

The Series "700" 'Load Lifter' has few parts—trouble-free performance assured! There's extra durability in the heat-treated helical gearing; extra-smooth operation because ball bearings are used throughout. Capacities from ½ ton up. Single and two-speed control and all types of suspension available.

Let the nearby "Shaw-Box" Distributor show how this rugged hoist can cut your load handling costs. Or write direct for Bulletin 410.

'Load Lifter'® ELECTRIC HOISTS

MANNING, MAXWELL & MOORE, INC.
MUSKEGON, MICHIGAN

Builders of "Shaw-Box" and 'Load Lifter' Cranes, 'Budgit' and 'Load Lifter' Hoists and other lifting specialties. Makers of 'Ashcroft' Gauges, 'Hancock' Valves, 'Consolidated' Safety and Relief Valves, 'American' and 'American-Microsen' Industrial Instruments, and Aircraft Products.

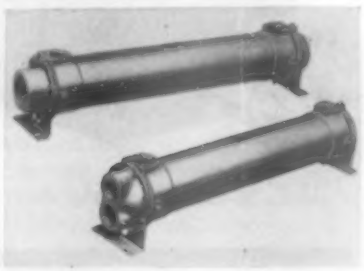

**FACTORY / EQUIPMENT NEWS**

*Begins on page 136*

For more about these products, circle item numbers on Reader Service card next to back cover.

**85—Mechanized Concrete Trowel** is powered by any standard ½- or ⅝-in. electric drill, 375 rpm. or less. Self-adjusting steel blades float and finish concrete in single operation. No hand finishing. Gets around objects, close to wall. *Elmo Mfg. Co.*

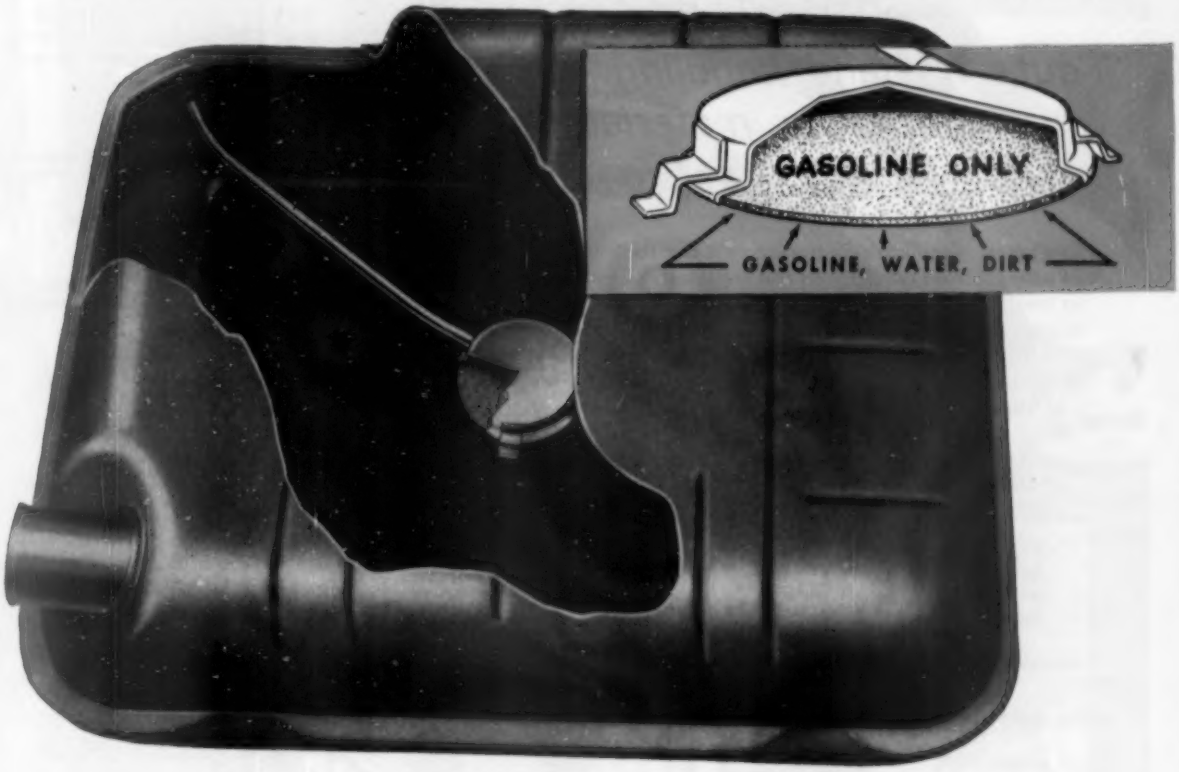
**86—Accumulator** cushions shock and vibration in hydraulic lift trucks. Permits faster, smoother operation. Takes bounce and jounce out of vehicle, reducing spillage and breakage, driver fatigue, structural strain. Device easily connected. *Greer Hydraulics, Inc.*



**87—Heat Exchangers** of stainless steel handle corrosive liquids or gases. Eliminate expansion strains due to radical temperature difference. Smooth-flow end bonnets. Single- and multi-pass models; many sizes, capacities. Meet JIC standards. *Young Radiator Co.*

*Turn the page*

## IN POWDER METALLURGY . . . IT'S AMPLEX




# Pour Water and Gasoline in this Tank— and the Car Will Run!

The OILITE® permanent metal filter makes this gas tank different from that of most cars. Installed as standard equipment in all Chrysler-built cars since World War II, it not only prevents water from entering the fuel line but keeps out all foreign particles.

Army Ordnance tests demonstrated its effectiveness. Experimental installations were made in a number of Army trucks using—(1) standard tube fuel intake (with filter at carburetor end of fuel line) (2) floating filter (3) OILITE filter.

Two pints of ice crystals were put in the trucks' fuel tanks. Those with the standard tube failed to operate after 10 seconds. Trucks with floating filters stopped after 14 minutes, while those equipped with OILITE filters continued operating indefinitely without interruption, providing a steady flow of clean gasoline.

OILITE fuel filters are good for the life of the car. The filter allows ample flow even with 98% of the pores blocked. Tin plating prevents excessive gum deposits while the sloshing action in the tank keeps the surface clean.

OILITE permanent metal filters can help you in many ways. They are unusually successful for depth filtering, diffusing, metering, separating and flame arresting.

The engineering facilities of Amplex and Chrysler, unmatched in the powder metal industry, are ready to assist you. Call or write today for information.

**CHRYSLER AMPLEX PRODUCTS**

OILITE Bearings
Permanent Metal Filters
Finished Machine Parts
Friction Units

*IT'S NEW! IT'S FREE!*
*First complete information on powder metal bearings, finished machine parts, filters and special parts. 48 pgs. Write for OILITE Engineering Manual E-55.*

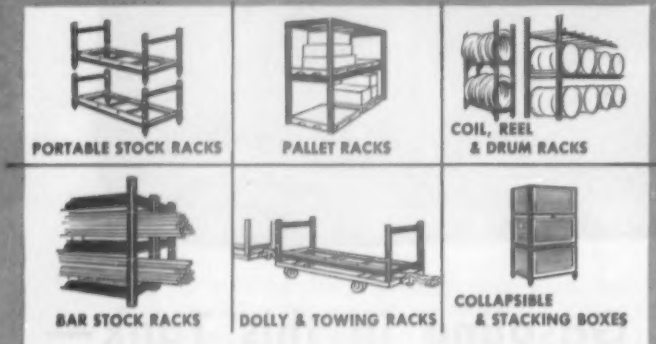
OILITE — *Only Chrysler makes OILITE*

**CHRYSLER CORPORATION • AMPLEX DIVISION**
**Dept. L.8 Detroit 31, Michigan • Overseas Distribution—Chrysler Export**

You Can stack ANYTHING on **E.M.I.** Racks

*cut time and handling costs*
*keep your materials*
**well stacked!**

Equipment Manufacturing storage racks that stack are fabricated of strong, square tubular steel and are adjustable to fit any space or unit load in your plant or warehouse. Special racks designed to your specifications. Field Engineering Service on any installatior Before you decide on a new warehouse, additional storage sp or the purchase of stacking equipment, write for our catalog. You save money, space and time with E. M. I. racks.




E.M.I. Pallet Racks are installed at the efficient American Locomotive Company Warehouse in St. Louis, Missouri.

*Write for Illustrated Catalog*

**EQUIPMENT MFG. INC.**

21560 HOOVER ROAD • DETROIT 5, MICHIGAN

Materials Handling Equipment — Stacking Racks for Industry

**FACTORY / EQUIPMENT NEWS**

*Begins on page 136*

For more about these products, circle item numbers on Reader Service card next to back cover.

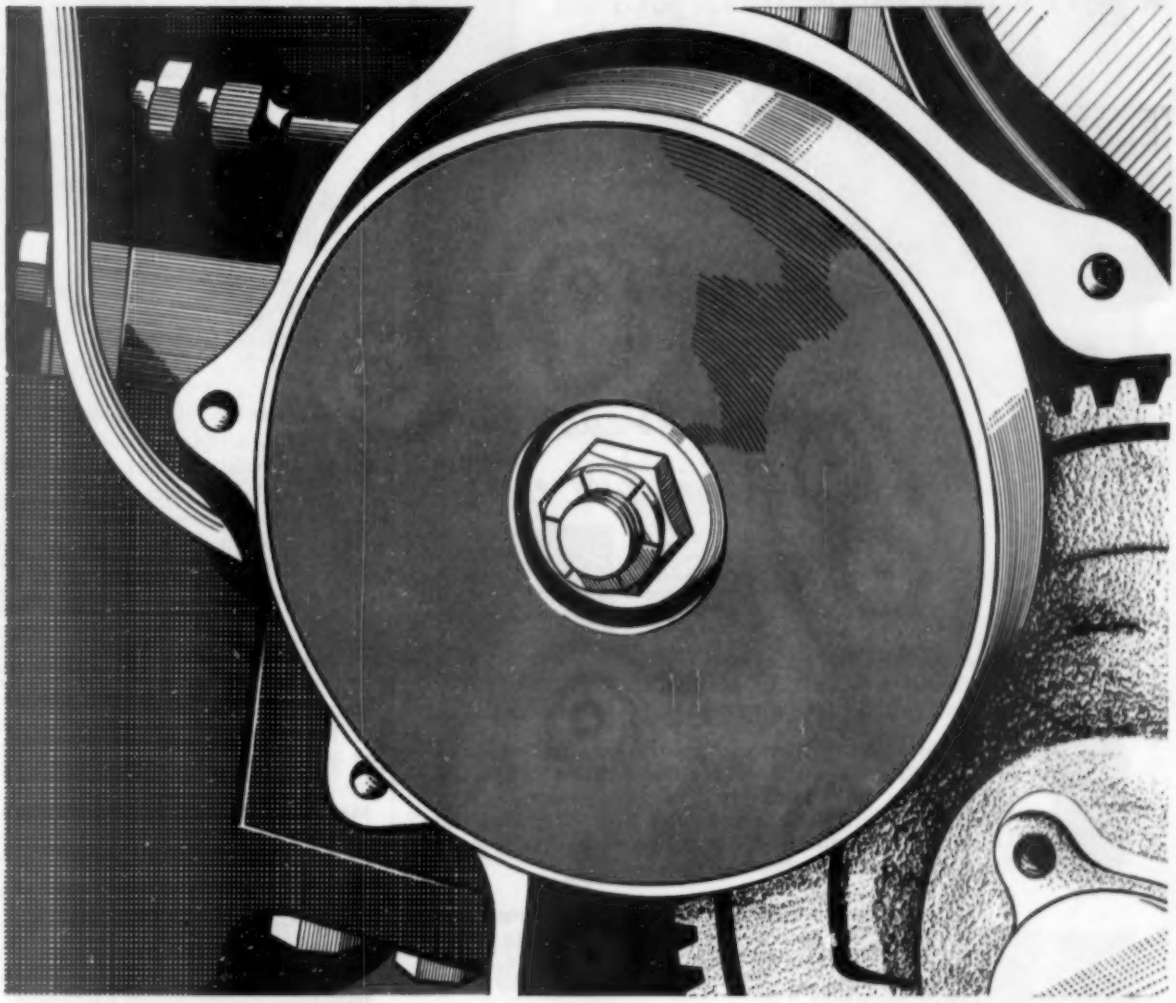
**88—Portable Welder** gives high rate of production on light-gage metals. Model 5403 provides welding accuracy from 1/10 of second to full second; prevents burning through work. 6-in. throat extendable to 18 in. Opening adjustable from 3-11½ in. *Sitler Corp.*

**89—Circuit Breaker,** 5-cycle at 14.4 kv., permits increase in transformer sizes to meet load growth without changing to heavier wire sizes. Faster interruption enables better fuse protection of equipment, as smaller-rating fuses may be used. *General Electric Co.*

**90—Addressograph** mechanizes many repetitive writing jobs. Model 30 features long-life carbon ribbon that produces fine-line printing; keeps plates, files, hands clean. You can eliminate plates you don't want to print at time of run. *Addressograph-Multigraph Corp.*

*Turn the page*

# FLEXLOC AT WORK



**MORE AND MORE FLEXLOC LOCKNUTS** are being used where assemblies must be held together. This electric chain saw is a good example of an application for which FLEXLOCS are well suited.

A FLEXLOC Self-Locking Nut is used here to hold the driver gear in place. Even high-speed cutting, extreme vibration, and rough handling do not loosen the FLEXLOC locknut. These one-piece, all-metal locknuts are available in a full range of sizes. Standard FLEXLOCS are stocked by authorized industrial distributors in sizes from #4 to 2". Write for Bulletin 866 and samples. STANDARD PRESSED STEEL CO., Jenkintown 11, Pa.

**DO YOU KNOW?** Standard FLEXLOCS smooth off rough bolt threads. The locking threads on all-metal FLEXLOCS are not chewed up when used on rough bolts.

Standard FLEXLOCS lock securely on bolts varying in diameter tolerances. The all-metal, resilient locking sections of the nut accommodate themselves to the diameter tolerances.

Standard FLEXLOCS are one piece, all metal. They are not affected by temperatures to 550°F. Nuts lacking these features have a more restricted temperature range.

Standard FLEXLOCS lock securely—stopped or seated—when 1½ threads of a standard bolt are past the top of the nut.

Standard FLEXLOCS are not affected by moisture, oil, dirt or grit. They lock efficiently under all conditions, regardless of the vibration encountered.

FLEXLOC®
LOCKNUT DIVISION
sps
JENKINTOWN PENNSYLVANIA

"Our Janitrols save us over 40% in fuel costs"

Says Mr. C. J. Mayle, President, Fremont Tool & Die Co., Fremont, Ohio, comparing Janitrol Unit Heaters with oil-fired steam heat used previously.

Here's how Janitrol engineers and equipment solved all of Mr. Mayle's tough heating problems.

● Bothersome drafts, caused by the exhaust of heated air in the removal of abrasive dusts, were eliminated by bringing in outside air, "tempered" by Janitrol DUCT Heaters. The Dura-tube heat tubes in the DUCT units minimized the corrosive effects of condensation caused by the cold outside air.

● The 'Surface' Industrial Processing Furnaces, "big brothers" to the Janitrol line, made warm spots in the shop area. Individual Janitrol Unit Heaters, with separate thermostats, provided uniform, zoned comfort throughout.

● Economical year 'round office comfort was obtained by using the same duct system for summer cooling and winter heating. The plant is ventilated in summer by the unit heater blowers.

These Janitrol Units temper the outside air which is brought in to replace the heated air exhausted in abrasive dust removal.

It is not only the superiority of Janitrol design, but also the training of its engineer-representatives who integrate and balance this equipment to meet your problem. For new, or remodeling advice, send these problems to us. No obligation.

®Janitrol Gas-Fired
UNIT HEATERS

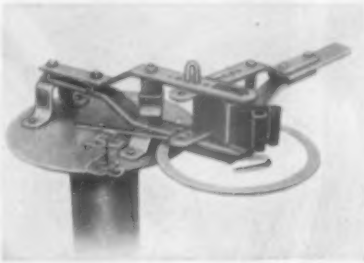
DIVISION OF SURFACE COMBUSTION CORPORATION
400 DUBLIN AVE., COLUMBUS 16, OHIO

MAKERS OF SURFACE INDUSTRIAL FURNACES AND KATHABAR HUMIDITY CONDITIONING


## FACTORY / EQUIPMENT NEWS

*Begins on page 136*

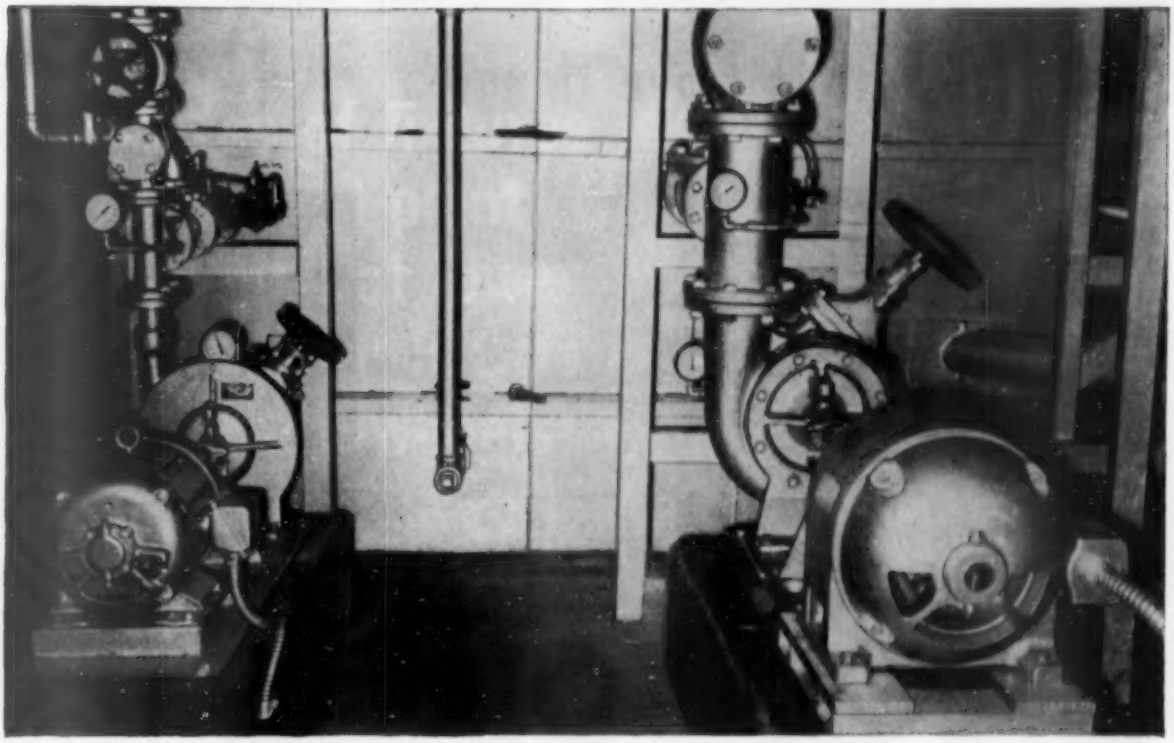
For more about these products, circle item numbers on Reader Service card next to back cover.



**91—Bender Dies** come in six types: For round or square bends on flat stock. To bend flat stock edgeways. For special o.d. steel tubing. For close return bends on pipe. For standard pipe and rigid conduit. For thinwall electrical metallic conduit. *Hossfeld Mfg. Co.*

**92—Safety Crane Hook** is positive-locking. Cannot be opened while in use even under swinging loads. Body of hook completely encloses sling at all times. Catch easily released by operator wearing heavy gloves. Made in 3- and 10-ton sizes. *Walpole Co.*

**93—Fume Control System** traps toxic and non-toxic fumes and dust at source. Moves directly over ladle or crucible being used to pour molten metal into molds, or other process or work giving off fumes. Operates with only 2500 cfm. of air. *Martin Equipment Co.*



# What special features make Gardner-Denver centrifugals the better choice?

Water friction inside a pump can rob you of power and efficiency—and that costs money. That's why Gardner-Denver takes special precautions to design interior passageways that are extremely smooth—that guide water through the pump with a minimum of turbulence.

A skimpy pump will wear itself out long before it should. That's why Gardner-Denver pumps are provided with sturdy bases that give rigid support—extra-sized shafts of high carbon alloy steel—heavy-duty roller bearings.

Write for descriptive bulletins.

GARDNER-DENVER

THE QUALITY LEADER IN COMPRESSORS, PUMPS AND ROCK DRILLS FOR CONSTRUCTION, MINING, PETROLEUM AND GENERAL INDUSTRY

Gardner-Denver Company, Quincy, Illinois
In Canada: Gardner-Denver Company (Canada), Ltd., 14 Curity Ave., Toronto 16, Ontario

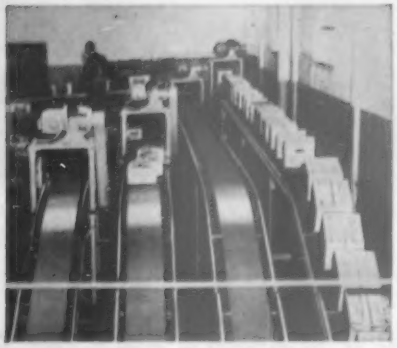
# Want to move things

## up

**For lifting or lowering — floor-to-floor — the INCLINEBELT**

Continuous package conveying — a complete belt conveyor system or the Inclinebelt—complete, compact easy-to-install, electric-motor powered unit. High, continuous-line load capacity for any floor elevation. Available in belt widths of 8-12-14-18-24-30 and 36 inches.

## down



**For inclined or horizontal conveying — the UTILITY BELT-VEYOR**

Conveys from floor-to-floor. Moves "packages" down, up or horizontally. Electric motor powered. Installs over existing stairways, or can be used as a portable Levelbelt conveyor. Four standard belt widths: 10-14-20 and 24 inch.

## or horizontally?

**For straight line or inclined conveying — assemble your own system or portable conveyor using HANDI-DRIVE pre-built units**

These stock, pre-built conveyor units make it easy to assemble what you want in a conveyor. Converts existing gravity conveyor to power conveyor — quickly and at low cost. Can be installed as single portable unit or complete system.

## Standard builds conveyors to speed any ONE or all THREE

*Call your Standard representative listed in your classified phone book or send for illustrated Standard General Catalog describing all three units — address Dept. FM-8.*

STANDARD CONVEYOR COMPANY

General Offices: North St. Paul 9, Minnesota • Sales and Service in Principal Cities

Standard

GRAVITY & POWER Conveyors

ROLLER • SLAT • WHEEL
SECTIONAL • BELT • CHAIN • PUSH-BAR

PORTABLE CONVEYOR UNITS:
HANDIBELT • INCLINEBELT • EXTENDOVEYOR • UTILITY BELT-VEYOR
HANDIPILER • LEVEL BELT • LITEWATE • HANDIDRIVE
PNEUMATIC TUBE SYSTEMS


**FACTORY / EQUIPMENT NEWS**

*Begins on page 136*

For more about these products, circle item numbers on Reader Service card next to back cover.

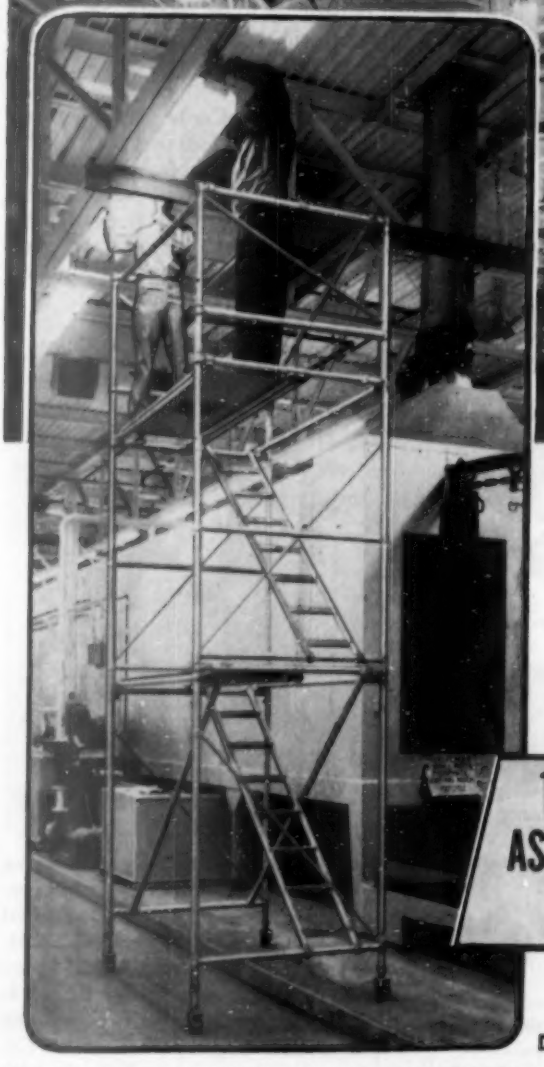
**94—Pressure Controls** provide high and low limits for steam, air, noncorrosive liquids and gases. For start or stop operations at pre-set maximum or minimum pressures with range 3-in. vacuum to 240 psi. Mount any position; ¼-in. npt. *Electronics Corp. of America.*

**95—Unit Coolers** are made in three types: For room temperatures over 35 deg.; for Freon with water defrost; for ammonia with water defrost for above or below 34-deg. temperatures. Many models and capacities available for each type. *Drayer-Hanson, Inc.*

**96—Mechanical Motor-Brake** is for jobs requiring frequent braking. Built into motor frame and enclosed in housing, saving as much as 7⅜ in. in length over electric brakes. Minimum maintenance, having no solenoids and coils. *Cleveland Electric Motor Co.*

*Turn the page*

# 45 acres of fixtures at new Ford plant maintained at lower cost with UP-RIGHT Scaffold-on-wheels



This ALUMINUM ALLOY scaffold provides the most economical and practical means to maintain overhead equipment in any plant, large or small. A tower of any height desired is ready in minutes. Individual 1-piece sections are unfolded and set one on top of the other. They lock into place instantly . . . no tools, wing nuts or bolts.

Your maintenance costs can be reduced by UP-RIGHT SCAFFOLD-ON-WHEELS.

**17-FT. UP-RIGHT TOWER SCAFFOLD ASSEMBLED IN 2 MINUTES BY 2 MEN**

Note leg adjustment for uneven floor.
Ford Plant, San Jose, California

• *Write for descriptive circular* •

**"UP-RIGHT" SCAFFOLDS**

DEPT. 104 • 1013 PARDEE • BERKELEY, CALIFORNIA

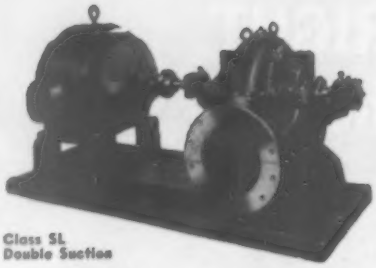
FACTORIES: BERKELEY, CALIF. AND TETERBORO, N. J. • OFFICES IN ALL PRINCIPAL CITIES

# WHICH OF THESE "BUFFALO" PUMPS COULD BE SOLVING YOUR PROBLEMS RIGHT NOW?

*(Efficiently — Economically)*

### CLEAR WATER

"Buffalo" Double Suction Pumps are the finest example of the "Q" Factor* that gives you the most for your pumping dollar. Hydraulically balanced, highly efficient and durable. In sizes to deliver from 10 to 14,000 gpm for circulating, air conditioning, other plant services. *Request Bulletin 955-Q.*



Class SL
Double Suction

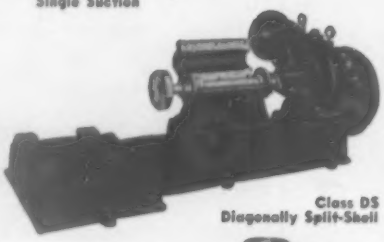
### BOILER FEED

For boiler feed and other clear water service against high pressures, *write for Bulletin 980* and see how efficiently these rugged "Buffalo" Type "RR" Pumps perform. In 2 and 4 stages to handle up to 500 psi. Capacities up to 900 gpm.

Class RR Multistage
Single Suction

### PAPER STOCKS

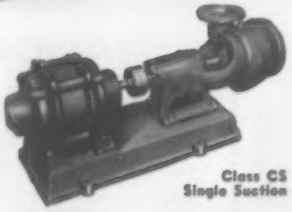
For handling high consistency liquids, you'll save money and trouble with non-clogging "Buffalo" Paper Stock Pumps. Available in alloys or rubber-lined for corrosive and abrasive liquids. A pump for every job described in *Bulletin 953.*



Class DS
Diagonally Split-Shell

### CHEMICALS

A complete line of "Buffalo" Pumps, ready to handle corrosive or abrasive liquids at least maintenance cost. Write for *Bulletins 976 and 982.*



Class CS
Single Suction

### OTHER PUMPS

"Buffalo" builds Vertical Ejectors, Sewage Pumps, Fire Pumps, Marine Pumps and the husky, space-saving Close-Coupled Pump shown. In short, there's a "Buffalo" Pump for best results in any application you may have in mind. Write us about *your* problem!

Class CCL Close-Coupled.
Write for Bulletin 957-D.

*The "Q" Factor—the built-in Quality which provides trouble-free satisfaction and long life.

"Buffalo" PUMPS

**BUFFALO PUMPS, INC.**

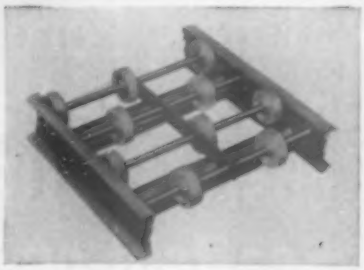
471 BROADWAY BUFFALO, N. Y.

*Subsidiary of Buffalo Forge Company*
Canada Pumps, Ltd., Kitchener, Ontario
Sales Representatives in all Principal Cities

A BETTER CENTRIFUGAL PUMP FOR EVERY LIQUID

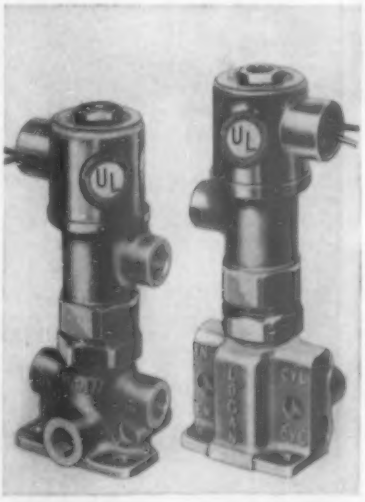



For more about these products, circle item numbers on Reader Service card next to back cover.



**97—Nylon-Wheel Conveyors** withstand any weather, temperatures from 150 to –10 deg. F. No lubrication. Wheels run on nylon bearings mounted in aluminum frame. Impervious to detergents, salt water, fruit acid, lactic acid in milk products. *Metzgar Conveyor Co.*

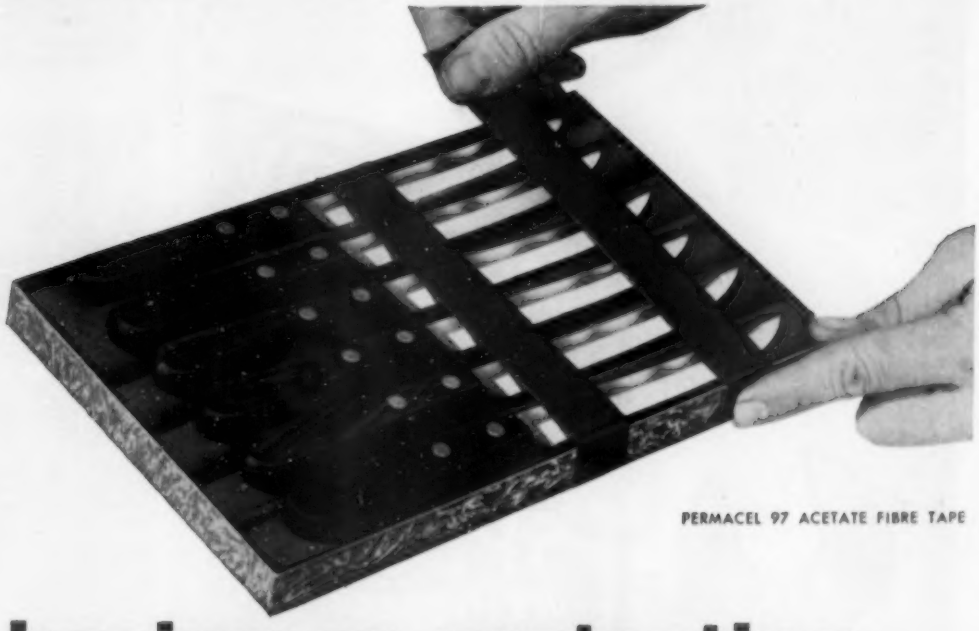
**98—Portable Cords** come in three models. For severe use, where subject to elements, abrasion, crushing, impact, moisture, oils, grease, acids. A similar type with free-stripping neoprene jacket. For normal mechanical damage and dampness. *Anaconda Wire & Cable Co.*



**99—Air Control Valves** in three types. Model 6668, 2- or 3-way: controls bleeder and pilot-operated master valves. Model 6669, dual-control, 2-way: same, but has two exhaust openings. Model 6678, 4-way, 2-position: for double-acting cylinders. *Logansport Machine Co.*

*Turn the page*

# Whatever the job...



PERMACEL 97 ACETATE FIBRE TAPE

# packaging or protecting

PERMACEL 64 CLOTH TAPE

SELF-STICKING

# PERMACEL® TAPES

*In our complete line, there's a self-sticking tape for every job . . . write Permacel Tape Corporation, New Brunswick, N. J.*

a Johnson & Johnson company

Herbrand can supply carbon steel wrenches in all popular sizes from 5/16" to 3½" openings, and can manufacture special wrenches to your exact specifications. Herbrand carbon steel wrenches are ideal for maintenance and production work, and to accompany finished products.

Herbrand industrial wrenches are drop forged from high carbon steel, and heat treated and tempered their entire length to assure utmost strength, endurance, and dependability. Surfaces and edges are ground smooth for accurate fit and easy handling. Finish is rust-resistant baked black enamel. Heads are ground bright. Get all the facts from your industrial distributor or write us for Catalog No. 10.

Herbrand produces forgings in any size or shape up to 200 lbs.

*Quality Tools since 1881*

**THE BINGHAM-HERBRAND CORPORATION**
Fremont, Ohio

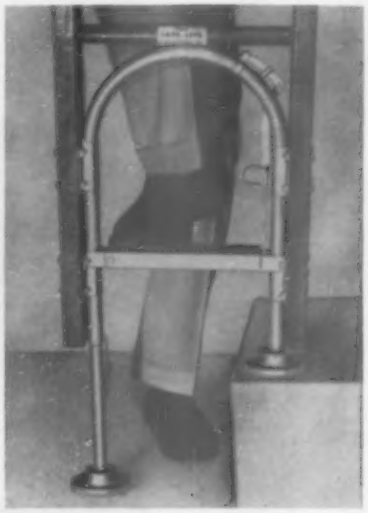
BH

Other Herbrand products include a complete line of Van-Chrome Tools..Ball Pein Hammers..Snips..Impact Sockets..¾" Drive Sockets..Complete Tool Sets


**FACTORY / EQUIPMENT NEWS**

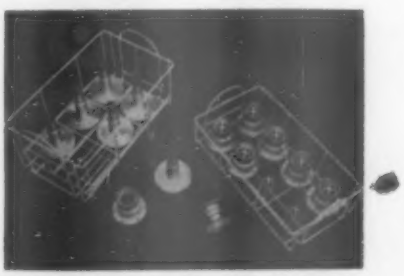
*Begins on page 136*

For more about these products, circle item numbers on Reader Service card next to back cover.



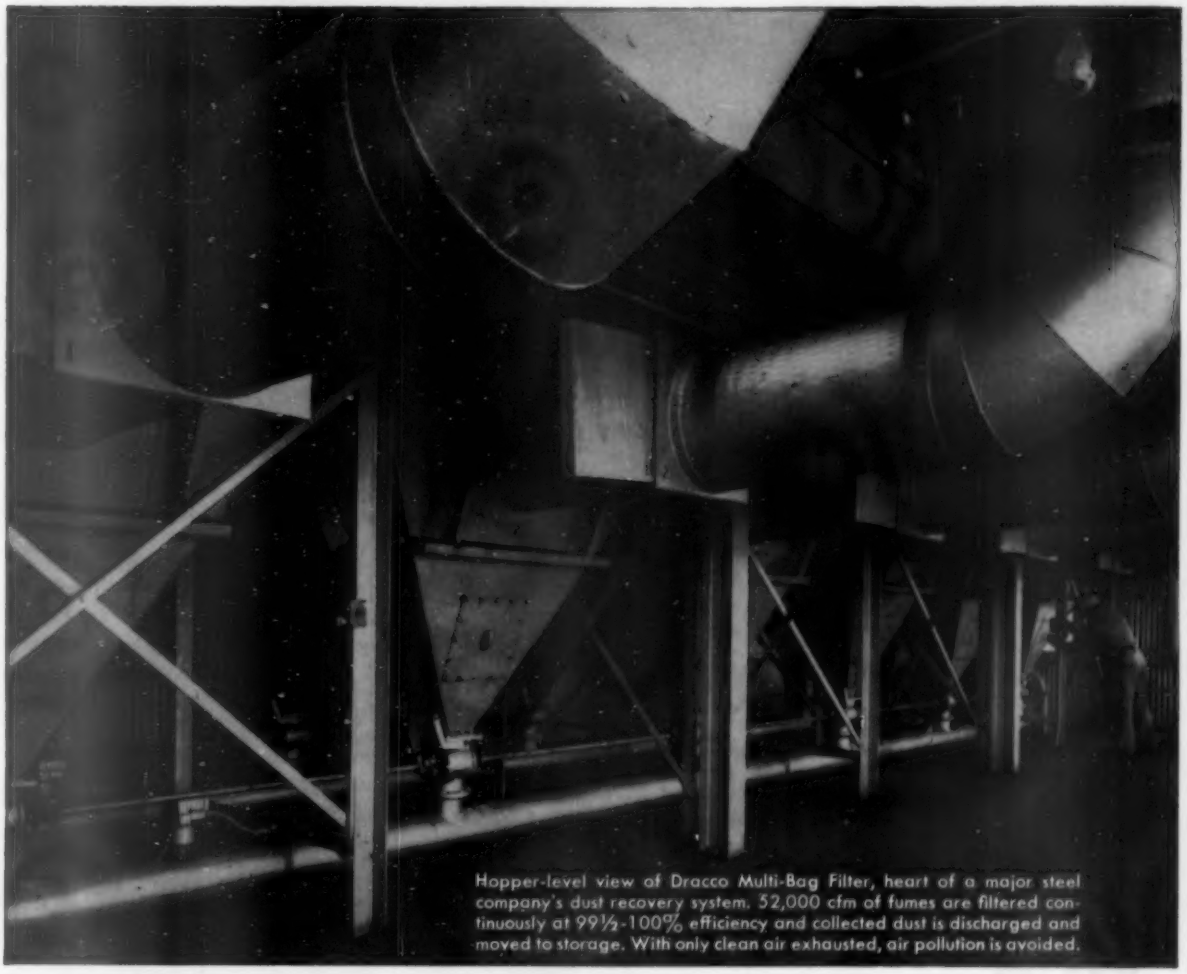
**100—Ladder Level** adjusts to any terrain, no matter how uneven. Stands upright securely (1000-lb. load test). Does not slip or skid. Automatic locking mechanism can be unlocked only by hand. On stairways or steps, takes full 9-in. riser. *H-B Industries, Inc.*

**101—Speed Reducers,** double-enveloping, worm gear, provide more hp. per lb. and cu. in.—require less space. 3½-in. center distance model has 13-hp. capacity; ratios of 5:1 to 60:1. Extended shaft, shaft-mounted, motorized versions. *Michigan Tool Co.*



**102—Parts Handling Baskets** are custom-made for every need, from initial machining to final assembly and shipping. Reduce rejects by protecting parts against scratches, burrs, abrasions. They stack; ride over conveyor rollers. *Wire and Iron Products, Inc.*

*Turn the page*



Hopper-level view of Dracco Multi-Bag Filter, heart of a major steel company's dust recovery system. 52,000 cfm of fumes are filtered continuously at 99½-100% efficiency and collected dust is discharged and moved to storage. With only clean air exhausted, air pollution is avoided.

# air pollution halted...*at a profit!*

Air pollution is one of industry's biggest and most costly problems. But here's how one major steel company cleaned up a "hot" situation by controlling fumes from its secondary bronze smelter—*at a profit!*

Zinc oxide-laden clouds from the smelter were formerly being exhausted to the atmosphere, causing waste of valuable materials and complaints from a nearby housing development. A Dracco Dust Recovery System consisting of cooler, filter and dust conveyor has been installed to alleviate this problem.

The cooler receives fumes at 2000°F and discharges them at 235°F to the filter where zinc oxide is collected continuously. Only clean air is exhausted—all visible dust has been removed. The dust conveyor carries collected material to storage.

As a result of this corrective action, pollution of air from this source has been eliminated. The company is realizing new profits from the sale of materials formerly lost to the atmosphere.

Your plant may be causing unhealthful air pollution and wasting valuable materials unnecessarily. A Dracco dust control engineer will show you how you can convert these losses to profits, and improve relations with your community. Call him today!

**DRACCO CORPORATION**
**4075 East 116th Street · Cleveland 5, Ohio**

*Want more information on Industrial Dust Recovery and Control? Write today for the 40-page Dracco Bulletin No. 800.*

**DRACCO** *Performance Proved*
*Airstream* CONVEYORS · DUST CONTROL EQUIPMENT

IN ALL KINDS OF CONSTRUCTION

you play it SAFE

. . . with Safety-Pulls

COFFING SAFETY-PULL RATCHET LEVER HOISTS
4 coil chain models, ½ and 5 tons
10 roller chain models, ¾ to 15 tons

Just as important as the time- and labor-saving advantages of Coffing Safety-Pull Ratchet Lever Hoists is the way each one protects your equipment from damage . . . your men from injury. Here's why:

Load cannot slip even if handle is accidentally released — because of dual Ratchet and Pawl principle, developed by Coffing and an outstanding Coffing advantage for over a quarter of a century.

Load is held positively at all times — there is no friction brake to slip or freeze.

Hooks will not break or straighten out.

"Safety-valve" handle will bend before any other part of hoist gives way.

Safety-Pulls are single-chain tested at 100 percent above warranted, rated capacity.

Find out more about how Coffing Safety-Pulls provide extra protection on the job. Write for Bulletin M-SP.

COFFING HOIST DIVISION
Duff-Norton Company • Danville, Ill.

Quik-Lift Electric Hoists • Hoist-Alls • Mighty-Midget Pullers • Spur-Geared Hoists
Differential Chain Hoists • Load Binders • I-Beam Trolleys

**FACTORY / EQUIPMENT NEWS**

*Begins on page 136*

For more about these products, circle item numbers on Reader Service card next to back cover.

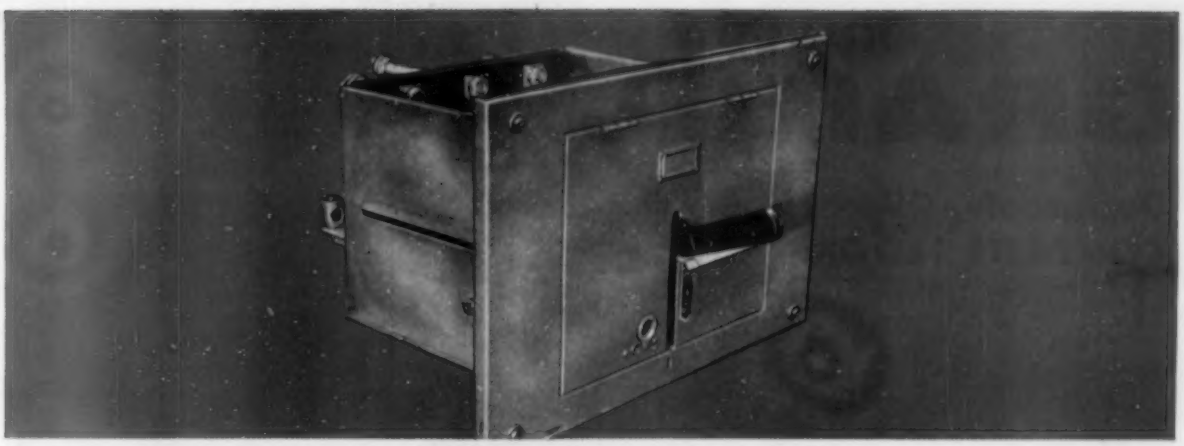
**103—Platform Truck** is engine-powered. Operator simply lowers steering handle to "moving" position to engage power; raises erect to apply brakes. "Shopmobile" pulls loads of 1000 lb. 3-wheeled unit turns in its own length. *Stahl Metal Products, Inc.*

**104—"Robot" Machine** performs up to 100 operations. It will mill, drill, punch, gage, test, assemble, perform other operations. Unit has six stations; performs four operations at each station. Units can be coupled to total of 50 stations. *Plymouth Enterprises, Inc.*

**105—Welders** are gasoline-engine-driven, generator types. They're compact, completely self-powered. May be equipped with optional running gear. Current ranges of 30-350 amp., a-c or d-c. All have infinite current adjustment steps. *Westinghouse Electric Corp.*

**106—Interlocking Oven Sections,** infra-red, are completely wired and ready for assembly. Four- and two-section models enable flexible construction; stationary or portable. Employ lava-coated, ceramic-type generators that do not burn out. *Dry Clime Lamp Corp.*

*Turn the page*



***BASIC BULLDOG SWITCH UNIT IS PROVED BY HUNDREDS OF INSTALLATIONS.*** Switch and fuse units are available in capacities of 30 to 1200 amperes. I-T-E Circuit Breakers available in capacities up to 4000 amperes. All meters, instruments and current transformers are of finest quality. All equipment listed by UL.

**BULLDOG DF-50 SWITCHBOARDS GIVE YOU**

# Time-tested Dependability

plus modern beauty!

## CUSTOM-TAILORED TO YOUR JOB AT A STANDARD PRICE!

How can we offer a custom-designed switchboard at a regular price? The answer is BullDog ingenuity! Standard circuit breakers or fusible units in a standard enclosure with the most modern of finishes are individually tailored to fit your requirements.

BullDog field engineers will consult with you as to the type, combination and arrangement of units needed for your specific application. Then you will receive a factory-built, custom-engineered switchboard that's designed for maximum protection and styled for the most modern factory or commercial building. Standardized, *performance-proved* components assure uniformly high quality and utmost dependability. Engineered to meet today's demands, BullDog DF-50 switchboards are so advanced they will stay modern for years.

Consult with your nearest BullDog field engineer for assistance in selecting all your electrical distribution needs. Or, write: BullDog Electric Products Company, Detroit 32, Michigan.

©BEPCO

*IF IT'S NEW*
*. . . IF IT'S DIFFERENT*
*. . . IF IT'S BETTER . . . IT'S*

**BULLDOG**

**ELECTRIC PRODUCTS COMPANY**

***A Division of I-T-E Circuit Breaker Company***

***Export Division:*** **13 East 40th Street, New York 16, New York.** ***In Canada:*** **BullDog Electric Products Company (Canada), Ltd., 80 Clayson Road, Toronto 15, Ontario.**

# TRUSCON GRANITEX

**Dustproofs, Oilproofs CONCRETE FLOORS**

Now! Your plant can have clean, sanitary concrete floors, for Granitex seals concrete floors and produces a dustproof, oilproof surface that can be easily swept or mopped. No germ-laden dust can hide away. Floors treated with Granitex are morale-builders, too. Employees just naturally appreciate working on floors that are dustfree and attractive.

## GRANITEX IS TOUGH!

Granitex contains Devran (epoxy resin) . . . new miracle ingredient that resists moisture, acids, alkali . . . and even shakes off rough, rugged traffic wear. Devran (epoxy resin) has been performance-proven in some of Truscon's most famous protective coatings . . . in all types of industry, under the most rigorous conditions.

*A ball of pure Devran is more resilient than a golf ball . . . will bounce higher when dropped on a concrete floor. Devran enables Granitex to "bounce back" after being subjected to harsh treatment, both chemical and physical.*

**DISCOVER NOW, WITH NO OBLIGATION, HOW EASILY AND ECONOMICALLY YOU CAN HAVE CLEAN, SANITARY CONCRETE FLOORS . . . SEND COUPON TODAY!**

**TRUSCON** *Laboratories*

Division of Devoe & Raynolds Co., Inc.

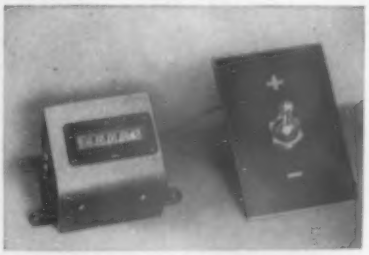
**TRUSCON LABORATORIES**
1700 Caniff, Dept. FS, Detroit 11, Michigan
**RUSH DETAILS ON GRANITEX TO:**

Name_____
Firm_____
Address_____
City_____ Zone_____ State_____


**FACTORY / EQUIPMENT NEWS**
*Begins on page 136*

For more about these products, circle item numbers on Reader Service card next to back cover.

**107—Welding Smoke Consumer** carries smoke away from operator, increasing visibility, reducing fatigue. Portable cabinet also serves as welding bench. Spatter drops to trap below grating on top. Tubing can be attached for smokeless welding. *Papec Machine Co.*



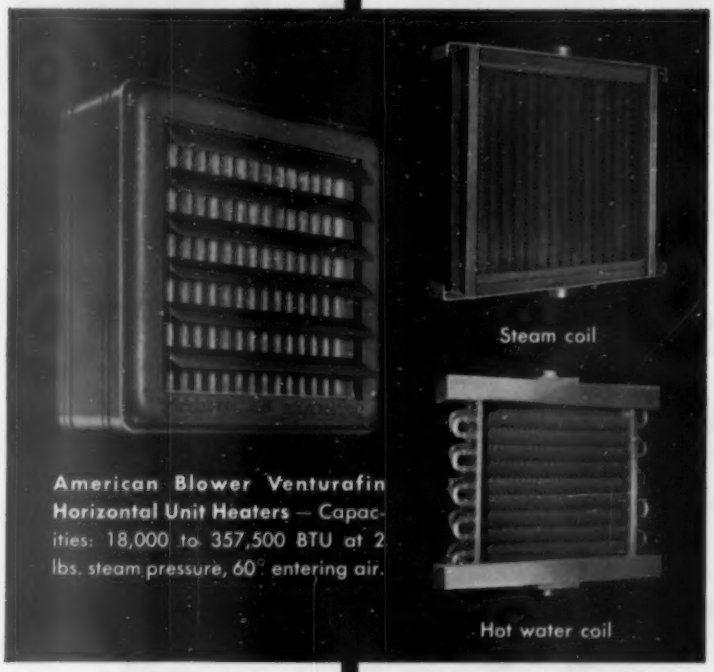
**108—Magnetic Counter** adds or subtracts with a flip of the switch. You'll find useful for automation systems, control engineering, stock control. Counts at speed of 700 per minute. Available with 3, 4, 5, or 6 figures; reset or non-reset. *Veeder-Root, Inc.*

**109—Pocket-Size Gas Indicator** is hardly larger than a fountain pen. For quick spot-check of combustible gases and vapors. Completely self-contained, operating on two small pen-light batteries. *Hogart Engineering Co. and Davis Emergency Equipment Co.*

*Turn the page*

American Blower Horizontal Unit Heaters offer you

# Separate coils for steam or hot water



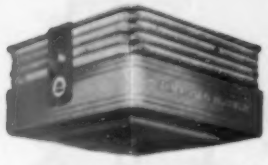

American Blower Venturafin Horizontal Unit Heaters — Capacities: 18,000 to 357,500 BTU at 2 lbs. steam pressure, 60° entering air.

At no extra cost you can choose *either steam or hot-water coils* when you select American Blower Venturafin Horizontal heaters for your jobs.

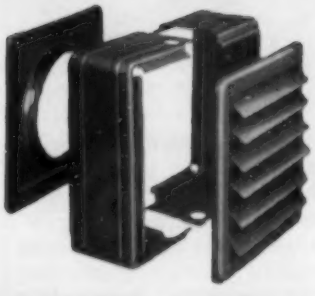
Both coils have high-quality non-ferrous fins, mechanically bonded to seamless copper tubes—which, in turn, are brazed to headers.

Hot-water coils have two-row serpentine construction, resulting in greater heating capacities at lower water volumes. One- or two-row steam coils are available.

For data, consult your nearest American Blower Branch Office, today.



American Blower offers a wide selection of Vertical Unit Heaters. Capacities: 58,400 to 560,000 BTU at 2 lbs. steam pressure, 60° entering air.



## Sturdy, durable casing

Heater casings are phosphatized to prevent rust and finished in attractive baked enamel. Hardware is cadmium plated. Complete casing is strong, durable, easy to clean.

## Other American Blower Unit Heaters

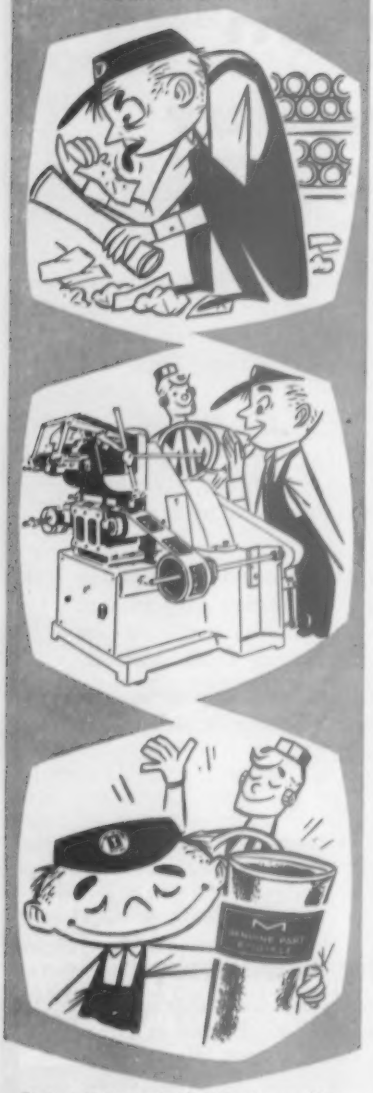
American Blower's gas-fired unit heaters and de luxe cabinet heaters for commercial and industrial use are compact, efficient and easy to install.

AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO
Division of American Radiator & Standard Sanitary Corporation

**AMERICAN BLOWER**

*Serving home and industry:* AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS & WALL TILE
DETROIT CONTROLS • KEWANEE BOILERS • ROSS EXCHANGERS • SUNBEAM AIR CONDITIONERS

making a
MARKED
IMPROVEMENT
in PARTS
IDENTIFICATION



Typical of the parts identification marking problems Markem solves is this one involving metal tail pipes. In place of costly, wrap-around paper labels that wouldn't stick, the manufacturer now prints complete label detail on pressure-sensitive tape, using a Markem 26A machine. Imprints are neat and clear—tape stays on. If identifying, decorating or designating a product, part or package is your problem, let Markem help you. Since 1911, Markem machines, type and ink have helped industry make its mark—better. They can do the same for you. Just write Markem Machine Company, Keene 18, New Hampshire.

MARKEM ...TO MAKE YOUR MARK

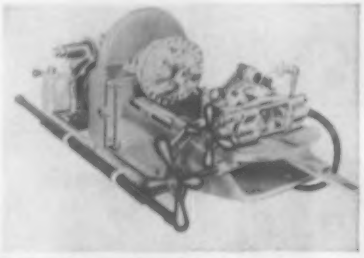
## FACTORY / EQUIPMENT NEWS

*Begins on page 136*

For more about these products, circle item numbers on Reader Service card next to back cover.

**110—Motorized Sheet Lifter** has arms that move in and out in a straight line, rather than an arc. Eliminates need for manual adjustments when changing from one size sheet to another. Requires less headroom. Manually operated model available. *Heppenstall Co.*

**111—Crane Runway Control** is an electronic device that warns of approach or shuts off movement of oncoming crane. Permits attendance to a disabled crane without danger from other cranes. Distance at which it's effective adjustable from 1-20 ft. *Femco, Inc.*

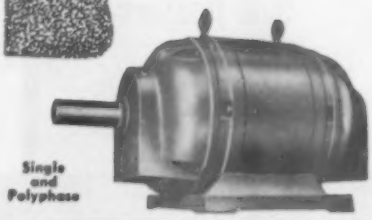


**112—Threading Machine** for pipe and bolt threads 2-in. pipe in 10-12 seconds; ½-in. pipe in 5-8 seconds. Portable unit is equipped with power grip wrenchless chuck. Reduces time required for chucking; increases safety of operation. *Beaver Pipe Tools, Inc.*

**113—Germanium Rectifiers** are for a-c to d-c power conversion where high power output, high efficiency, no aging, and small unit size are required. For 10 volts to 100 kv. and 10-100,000 amp. Natural, forced convection; liquid-cooled styles. *International Rectifier Corp.*

*Turn the page*

CUSTOM-BUILT—
NOT CUSTOM PRICED




Fully enclosed Ball Bearings; semi-enclosed construction that protects against dripping and splashing hazards and assures cool, continuous operation. Available in polyphase—from ½ to 60 hp, single phase—from ½ to 5 hp, for wide adaptability of use and greater flexibility in your power planning.

*Write for Complete Details Today*

VALLEY
ELECTRIC CORPORATION
4221 FOREST PARK BLVD. · ST. LOUIS 8, MO.

WHERE
TO BUY

FLUX
SOLDERING. BRAZING. WELDING
L. B. ALLEN CO., INC.
6781 BRYN MAWR AVE., CHICAGO 31, ILL.

BOWERS BATTERIES
*Always Better*
BOWERS BATTERY & SPARK PLUG CO., READING, PA.

IT'S LYON 5 TO 1

***The votes of key men in companies throughout the country speak volumes for Lyon. For these men gave Lyon five times more first choice votes than the second highest manufacturer! And twice as many as the next twelve combined!***

A nationally known research company compiled these figures when they asked key men in 5,000 companies this question:

***"If your company were in the market for steel equipment such as steel shelving, lockers, work benches, shop boxes, etc., what manufacturers would you consider?"***

Your nearest Lyon Dealer offers the world's *most diversified* and *most preferred* line of quality steel equipment. (A few are shown below.) Equally important, he can show you how to get the most out of steel equipment in terms of time, space and money.

**LYON METAL PRODUCTS, INC.**
**General Offices: 812 Monroe Ave., Aurora, Ill.**
**Factories in Aurora, Ill. and York, Pa.**
**Dealers and Branches in All Principal Cities**

***Lyon also has complete facilities for manufacturing special items to your specifications.***

LYON®

STEEL EQUIPMENT

for BUSINESS • INDUSTRY • INSTITUTIONS
also STEEL KITCHENS for THE HOME

A PARTIAL LIST OF LYON STANDARD PRODUCTS

- Shelving
- Lockers
- Stools
- Bin Units
- Kitchen Cabinets
- Cabinet Benches
- Storage Cabinets
- Drawing Tables
- Tool Toters
- Bar Racks
- Tool Boxes
- Parts Cases
- New Freedom Kitchens
- Display Equipment
- Toolroom Equipment
- Wood Working Benches
- Flat Drawer Files
- Revolving Bins
- Filing Cabinets
- Hanging Cabinets
- Folding Chairs
- Coat Racks
- Work Benches
- Bench Drawers
- Service Carts
- Sorting Files
- Drawer Units
- Hopper Bins
- Tool Stands
- Shop Boxes
- Tool Trays
- Shop Desks

# AIM to unitize with

Unitizing of random length hardwood flooring permits quick and easy handling for storage. Idea 531

Steel landing mats for use by the armed forces are unitized for ease in handling. Idea 537

Automotive axles unitized for safe shipment and efficient handling with Acme Steel strapping. Idea 533

Unitized lumber is easily handled by fork truck from outdoor stocks to carrier. Idea 534

Self-palletized brick pack speeds up deliveries over former manual brick-by-brick loading. Idea 535

# Acme Steel Strapping ideas . . . and save handling costs

Shipping many units strapped as one cuts loading and handling time to a minimum. Idea 536

Aluminum bar stock is self-palletized for easy handling in this unitizing idea. Idea 532

Unitizing—the art of preparing many packages or products into a single unit for handling—is proving to hundreds of manufacturers that shipping and handling costs can be cut—movements of materials speeded up. It's all in the application ideas brought about by the use of Acme Steel strapping and strapping tools . . . and the intelligence with which these ideas are originated and developed by your *Acme Idea Man. It's important to know, too, that unitizing isn't restricted to uniform squared-off packages; irregular product shapes and sizes can be unitized.

Talk to your *Acme Idea Man. He'll give you a shrewd analysis of shipping problems. You can reach him by calling the nearest Acme Steel office . . . or by using the coupon.

Remember—for you, the *idea* is the payoff.

## ask your *Acme Idea Man to help solve your problems

ACME STEEL PRODUCTS DIVISION
**ACME STEEL COMPANY**
2840 Archer Avenue, Chicago 8, Illinois

**Get this new UNITIZING BOOK** showing industrial unitizing ideas made possible by the use of Acme Steel Strapping. Fill out coupon on right.

**ACME STEEL PRODUCTS DIVISION, Dept. DE 85**
Acme Steel Company
2840 Archer Avenue, Chicago 8, Illinois
Please send me further information on Acme Steel's Safe, Lower-Cost Shipping Methods. I am interested in ☐ Steel Strapping; ☐ Wire Stitching; ☐ having an Acme Idea Man call on me.

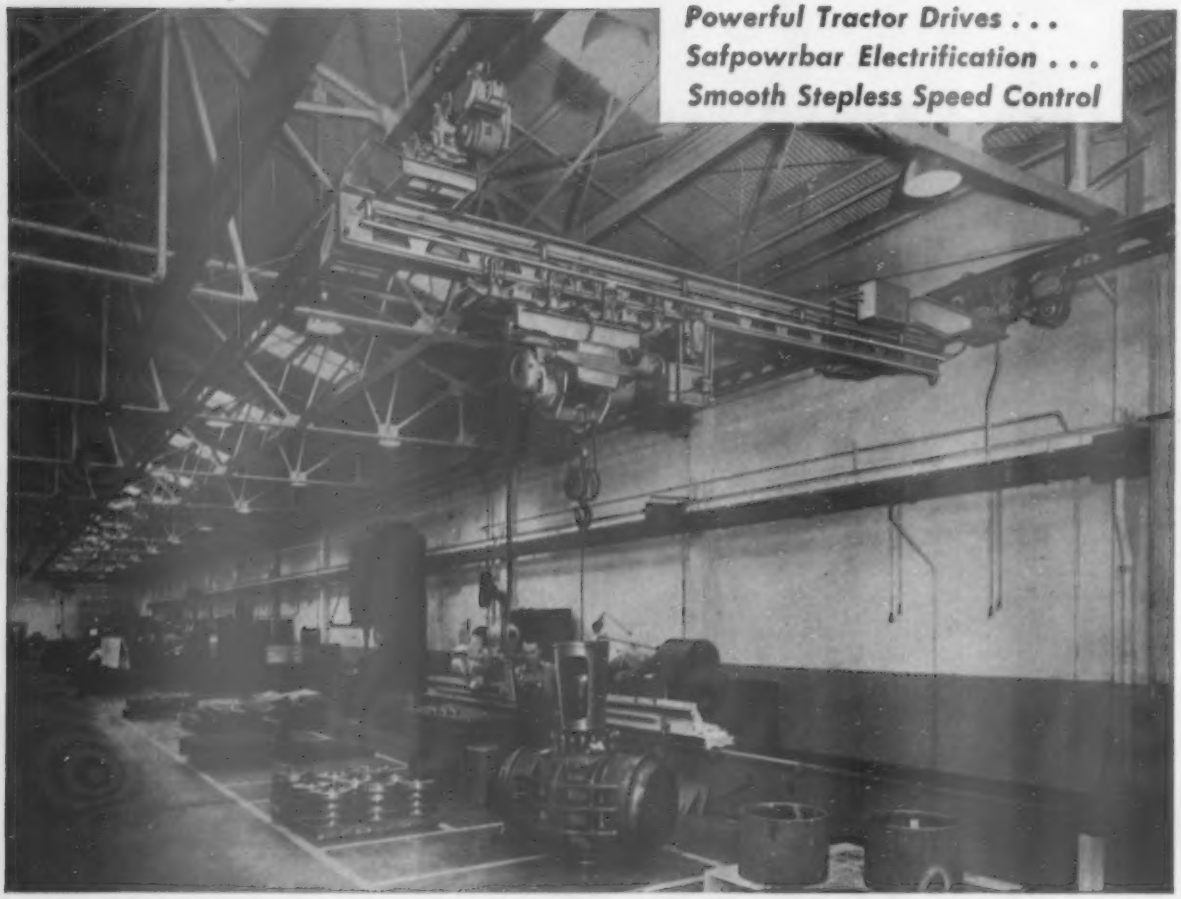
Name_____ Title_____

Company_____

Address_____

City_____ Zone_____ State_____

# A *Mighty Fine* 5 TON CRANE



***Powerful Tractor Drives . . .***
***Safpowrbar Electrification . . .***
***Smooth Stepless Speed Control***

HERE IS a modern 5 ton crane that offers you the finest in performance. Completely motorized, this 22'-0" long heavy-duty crane is floor-operated with all motions controlled by the pendant push-button station.

Rugged four-wheel tractor units propel both the bridge and the carrier; two units on the bridge and one on the carrier. The tractors not only have tremendous draw-bar pull for their size, but are easy to inspect and maintain. If ever necessary, a tractor can be quickly uncoupled and replaced by a spare.

Reactor type single-speed control provides unusually smooth acceleration for bridge and carrier drives which have travel speeds of 125 fpm.

Safety-conscious people will find Cleveland Tramrail Safpowrbar electrification on the crane and runway of tremendous advantage. It protects against serious injuries from accidental contact, and of additional interest, the sliding collector shoes have approximately five times the life of collector wheels.

This crane is only one of dozens of types and sizes Cleveland Tramrail has available. So whatever your needs, you can be sure that Cleveland Tramrail is in a position to serve you.

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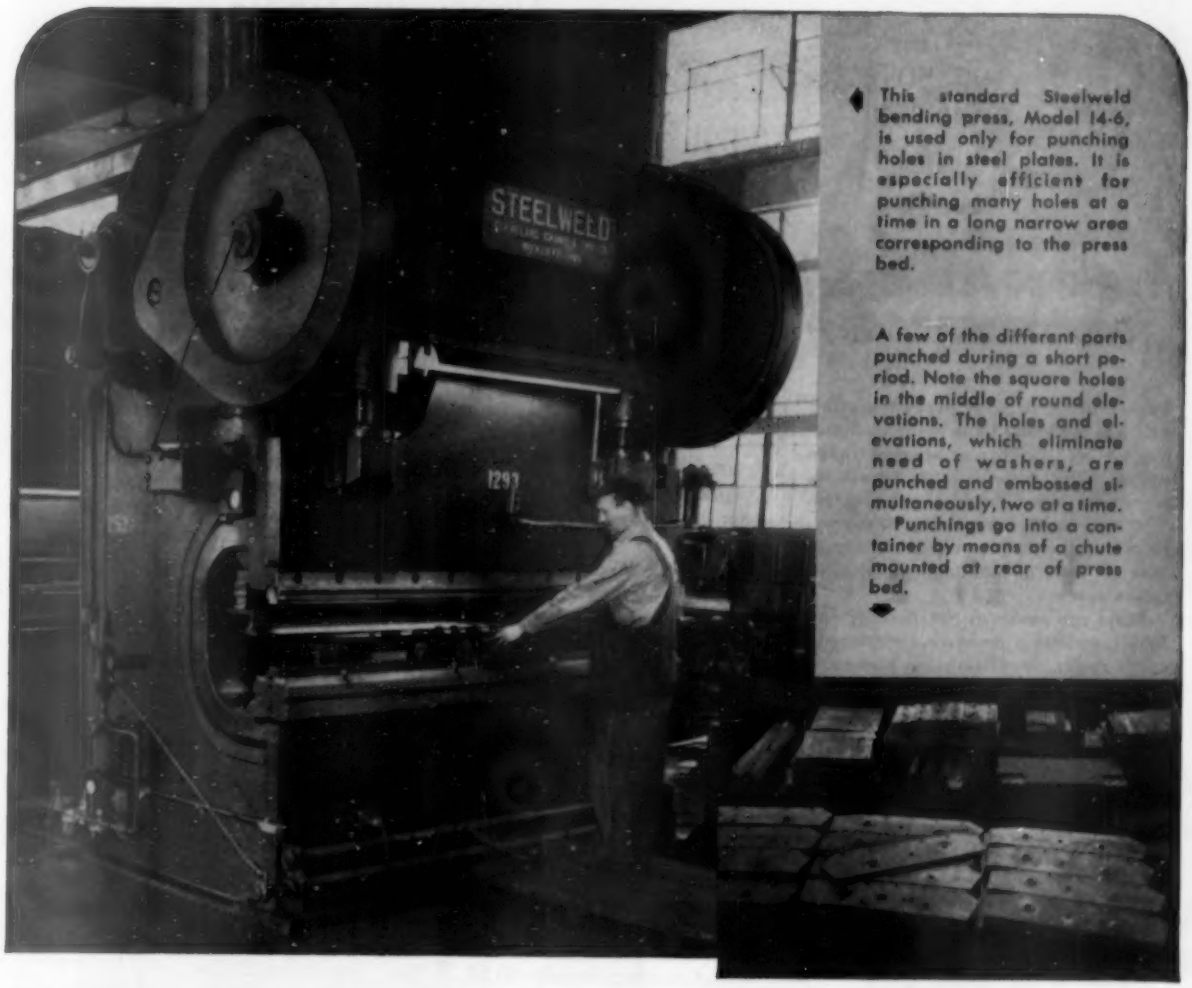
**CLEVELAND TRAMRAIL**
**OVERHEAD MATERIALS HANDLING EQUIPMENT**

# Press Brake Used Solely For Multiple Punching




This standard Steelweld bending press, Model 14-6, is used only for punching holes in steel plates. It is especially efficient for punching many holes at a time in a long narrow area corresponding to the press bed.

A few of the different parts punched during a short period. Note the square holes in the middle of round elevations. The holes and elevations, which eliminate need of washers, are punched and embossed simultaneously, two at a time.

Punchings go into a container by means of a chute mounted at rear of press bed.

BENDING BRAKES are not always used for bending. Here is one that is used solely for multiple-punching work. It is on its 12th year of continuous operation, punching holes of various sizes and numbers.

While other Steelweld presses in the plant where this machine is located handle many bending and forming operations, any Steelweld can be quickly switched from one form of work to another and thus take care of a wide variety of jobs: bending, forming, multiple-punching, blanking, etc.

Steelweld Bending Presses are versatile, heavily-built tools designed for quick set-up, easy operation and long trouble-free performance. Hundreds of these machines are serving every segment of the metal-working industry. If you need a press brake, you will be happy with a tried and proven Steelweld.

***GET THIS BOOK!***

**CATALOG No. 2010 gives construction and engineering details. Profusely illustrated.**

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3260 EAST 281ST STREET, WICKLIFFE, OHIO

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***BENDING PRESSES***

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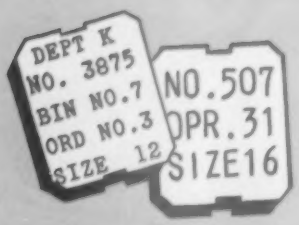


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# FACTORY | LABOR RELATIONS NEWS

By PAUL A. KING, Attorney, Bigelow-Sanford Carpet Company, Inc., Member, New York Bar

## Ford Pensions Bigger Than Its GAW

Lost in the hullaballoo of talk about the GAW gains made by Ford workers was the vigorous push forward given their pensions through the same set of negotiations. As a result, the Ford worker pension plan again becomes a goal to be shot at by every other union in the country. Here's a quick rundown of the main changes made:

. . . 1) *Maximum benefits* hiked from $161 a month (including Social Security) to $188.50 for a 40-year employee.

. . . 2) *Disability benefits* jacked up to $135 per month for a 30-year employee—from $90. Forty-year employees get $180 a month. When they hit 65, their Social Security and normal pension benefit is substituted for the disability benefit.

. . . 3) *Service beyond 30 years* will be credited, that is, the 30-year limit was dropped.

. . . 4) *Normal retirement* benefit is pegged at $2.25 for each year of credited service instead of $1.75.

. . . 5) *Vesting installed* for the first time. Employees terminating at or after age 40 with 10 or more years of service get a monthly deferred vesting benefit of $2.25 for each year of creditable service accrued after age 30 (payable from the pension fund at age 65).

. . . 6) *Employees retiring early* can elect immediate or deferred payments as desired.

. . . 7) *Presently retired* employees are also applicable for new benefit payments.

## Profit-Sharing Bridges Gap

There's a big jump between a Christmas bonus and sharing profits with employees. But employers whose lunchtime chatter is peppered with comments about the indolent attitude of contemporary workers would do well to expose themselves to the philosophy of the Council of Profit Sharing Industries.

A good place to have secured this exposure might have been at the eastern spring conference of the Council where employer after employer restated his faith in profit-sharing as a method of bridging the gap between capital and labor. Said Walter J. Wheeler, Jr., top kick at Pitney-Bowes: "We in the Council believe that profit-sharing is the spark that can bridge that gap — that can close the circuit, and re-energize our capitalistic system. Profit-sharing, by attacking the labor-management problem at its basic point of contention, seems to us to be the only fundamental way to resolve it."

Listen to John M. Ely, President of Prexy's, a New York City chain of luncheonettes: "We couldn't run our business without profit-sharing. It gives the employees a sense of belonging and a real understanding of profits. Morale was never higher than the year our profits dropped."

Anthony Yonto, President of Quality Casting Company, Orville, Ohio, testified: "The plan has been a great incentive for employees. Their attitudes toward the work have even helped sell customers who visited the plant." And so on during the entire session.

What's the magic of "Profit-Sharing"? Will it cut down the constant haggling between union and management? Will it boost productivity? Will it work for you? Best way to find out is to talk to those companies who have installed profit-sharing. And as a start, we suggest you write Joseph B. Meier, Executive Secretary of the Council of Profit Sharing Industries, for material on the subject and a list of companies in your area you might get in touch with. His address: 337 W. Madison Street, Chicago 6.

Also, don't overlook "Tax Factors and Related Business Considerations in Establishing Profit-Sharing Plans." It's free for the asking. Write to Prentice-Hall, Inc., 70 Fifth Ave., N. Y., for a copy.

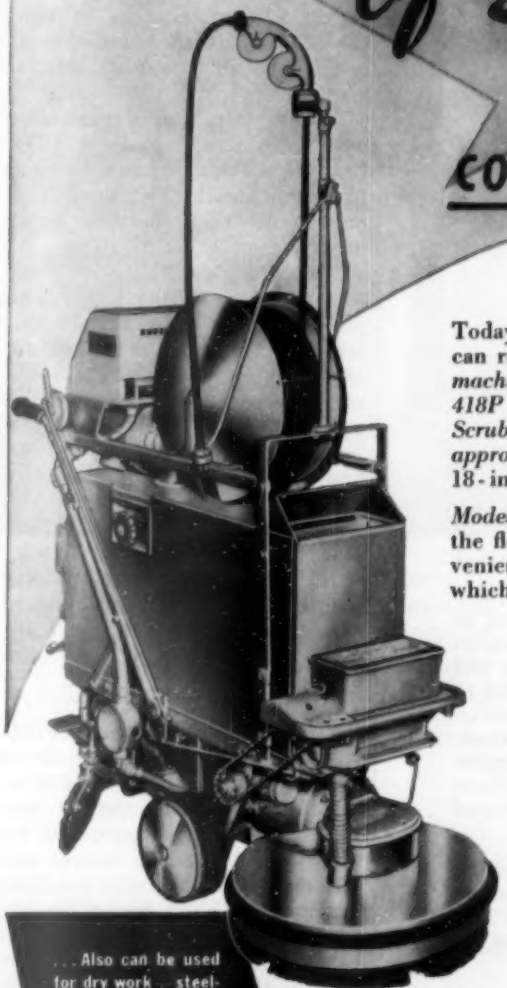
Here's another book worth look-

SMALL-AREA BUILDINGS...

# Save 2/3 of Every Hour of Scrubbing Time

WITH A

## COMBINATION SCRUBBER-VAC!



...Also can be used for dry work, steel-wooling, et cetera

(Powder Dispenser is an accessory)

Today, even buildings with but 2,000 to 15,000 sq. ft. of floor space can reap the labor-saving, cost-reducing benefits of *combination-machine-scrubbing.* Here's a *Combination Scrubber-Vac, Model 418P* at left, that's specially designed for such buildings. This *Scrubber-Vac,* which has an 18-inch brush ring, cleans floors in *approximately one-third the time* required with a conventional 18-inch machine and separate vac unit.

*Model 418P* applies the cleanser, scrubs, and picks up (damp-dries the floor) — *all in one operation!* Maintenance men like the convenience of working with this single unit... the thoroughness with which it cleans... and the features that make the machine simple to operate. It's *self-propelled,* and has a *positive* clutch. There are no switches to set for *fast* or *slow*—slight pressure of the hand on clutch lever adjusts speed to desired rate. The powerful vac performs efficiently and quietly. (Powder dispenser is optional.) Compactly built, the *418P* also serves advantageously in larger buildings for the care of floors in narrow aisles and congested areas.

*Finnell* makes *Scrubber-Vac Machines* for small, vast, and intermediate operations, and in *self-powered* as well as *electric* models. From this complete line, you can choose the size and model that's exactly right for *your* job (no need to *over-buy* or *under-buy*). It's also good to know that you can lease or purchase a *Scrubber-Vac,* and that *there's a Finnell man nearby* to help train your maintenance operators in the proper use of the machine and to make periodic check-ups. For demonstration, consultation, or literature, phone or write nearest *Finnell Branch* or Finnell System, Inc., 2508 East Street, Elkhart, Indiana. Branch Offices in all principal cities of the United States and Canada.

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*Originators of Power Scrubbing and Polishing Machines*

Everything FINNELL for Floor Care

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"BIG 4"

1. Variable capacities, with constant pressure at high efficiency.
2. Heavy, rugged construction . . . minimizing noise and vibration.
3. Adaptable to high-speed, direct-connected drives.
4. Low maintenance . . . long-time dependability.

Check your present blowers or exhausters—if they don't measure up, ask for suggestions from the R-C engineer.

Long-time, reliable, economical operation of your Centrifugal Blowers or Exhausters calls for this combination of "BIG 4" essentials which can be obtained only in R-C equipment.

They apply equally well to R-C Single-Stage or Multi-Stage Units, in all sizes and capacities from 2,000 cfm to 100,000 cfm. You can select an R-C Centrifugal which is closely matched to your requirements. This usually results in lower first cost and reduced operating expense.

For new installations or for replacement of unsatisfactory equipment, we suggest you call in an R-C engineer for unbiased advice.

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Centrifugal and Rotary Positive Blowers and Exhausters • Positive Displacement Meters • Vacuum Pumps • Gas Pumps • Inert Gas Generators • Spiraxial Compressors


**FACTORY / LABOR RELATIONS NEWS**

*Begins on page 206*

ing into: "Profit-Sharing in American Business" by Edwin B. Flippo. It costs $3 and is published by the College of Commerce and Administration of Ohio State University, Columbus.

## Unemployment Pay Is Still Pay

Here's a good example of what GAW (Guaranteed Annual Wage) is up against in state unemployment laws.

Quaker Oats had a guaranteed work plan dating back to 1934. Laid-off workers received 70 hours pay each month. The number of months depended on their length of service.

Three Quaker Oats employees were laid off—and filed for unemployment pay in Oregon. Oregon law gives such pay to workers for any week in which they are unemployed and they do not receive wages in excess of the unemployment pay. *What are wages?* "All remuneration for employment including the cash value . . . of all remuneration paid in any medium other than cash."

An Oregon court turned the three claimants down. The guaranteed payments were "wages" said the court, and therefore they were not unemployed.

We quote the court:

"It is true that the employees during their layoff performed no actual productive service, but this notwithstanding, the relationship of employer and employee continued, for they were entitled to receive and did receive, from their employer during their layoff period for the weeks they claimed unemployment benefits, remuneration on the same basis as their regular wages, which was a sum in excess of that which they would have received by way of such unemployment benefits."

"It is clear . . . that the remuneration received . . . was not a gratuity, gift or bonus. It is a guaranteed payment which the company obligated itself to make to its employees so as to insure their continued

# *The story of 5 benefits Wayne Screw Products gets from using* STANICUT CUTTING OIL

**Plant Foreman Al Ziegman (left) and Standard industrial lubrication specialist L. J. Loomis examine pitch diameter of screw threads. L. J. Loomis' engineering background plus his field experience in industrial lubrication, customers find, pays off *for them.* Lee is a graduate of Tri-State college of Indiana with a B.S. degree. Before entering field work, he completed Standard Sales Engineering School.**

**STANICUT Oil 137 BCS solved finish problem for Wayne Screw Products Company, gave better finish on screw and machined parts like these—plus four other important benefits.**

Management at Wayne Screw Products Company, Detroit, found they were not getting a completely satisfactory finish on aircraft quality stainless steel, which the plant was machining. They followed a suggestion made by their Standard Oil lubrication specialist to switch to STANICUT Oil 137 BCS. The result: five benefits.

1. Better finish
2. Higher quality work
3. Longer tool life
4. Higher production because of less down time for tool sharpening and adjusting
5. Cutting oil costs reduced approximately 50%

At first STANICUT Oil 137 BCS was used in two automatic screw machines—a National Acme Multi-Spindle and a Brown & Sharpe Single Spindle. Production benefits prompted Wayne Screw Products to convert other equipment to STANICUT Oil 137 BCS—and with similar results.

Delivering benefits like this is an old story for STANICUT Oil 137 BCS. A Standard Oil lubrication specialist will be happy to demonstrate how Standard's cutting oils can perform with similar results for you. In the Midwest, a call to your nearby Standard Oil office will bring a prompt response. Or contact Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

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Pushes tape — Pulls wire — ELECTRICALLY!
Instead of 2 to 8 men—one man can now push tape through 175 feet of conduit, around five 90 degree bends; then pull wire back—all in a fraction of the time formerly used. Ideal for difficult runs impossible to push by hand.
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*Begins on page 206*

availability for service when there was need therefor. It served the same purpose as 'wages' to the recipient in that it helped him to meet the expenses of living, which is the primary objective of Unemployment Compensation Law." *(Tweten vs. Oregon State Unemployment Law)*

## Be Careful When Hiring Minors

Employers who hire minors may be sticking their necks out. If it's your practice, better check to see if the Workmen's Compensation law of your state is similar to that in New York.

A minor was seriously injured on the job. The New York State board gave a *double* award to the minor. Half the employer paid, the other half the carrier. That's the law in New York (in New Jersey, too)!

The employer, incidentally, tried to pin the hiring on the union. The union contract required the employer to hire through the union. The union had referred the minor to the employer. So it was the union's responsibility, said the employer. The court that heard the case said *no!* The union merely referred; it didn't compel the employer to hire the minor. *(Livingston vs. Tel-Ant Electronic Company)*

## No Jobless Pay

In a union shop, you don't have to join the union, but if you don't within the prescribed time, you're out of a job. And in New York State, at least, you're also out of unemployment pay.

The appellate division of the New York Supreme Court said:

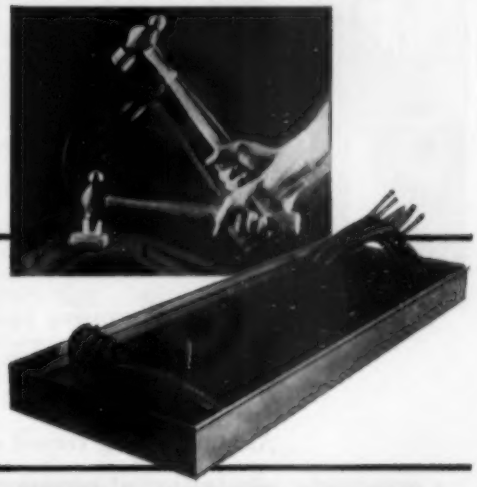
"When there is an effective union agreement with the employer by which membership in good standing is a necessary ingredient to continued employment, a man who chooses not to have union membership necessarily chooses not to have work in that shop." "This is quite as 'voluntary' an act as most choices

# NEW Silco-Flex MOTOR INSULATION

## Offers These Amazing Physical Properties

Allis-Chalmers, working with Dow Corning Corporation, has developed *Silco-Flex* motor and generator insulation . . . truly new in concept . . . truly new in effectiveness.

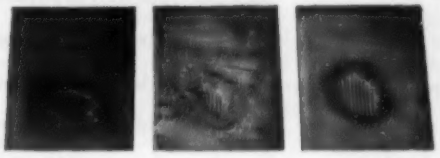
*Silco-Flex* insulation employs a pure silicone rubber combined with specially developed application techniques to produce an insulation unmatched by any other in use today.



● **Flexibility and Resilience** — *Silco-Flex* insulation remains flexible and resilient indefinitely. It is especially resistant to mechanical abuse and to stresses of overloading, rapid starting and stopping.

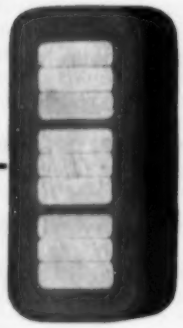
● **Moisture Resistance** — Completely sealed, *Silco-Flex* insulated coils are the most moisture-resistant commercial coils ever produced. They are production-tested while submerged in water . . . by far the most complete and searching high potential test used.

● **Abrasion Resistance** — Samples of insulation at right show effects after sandblasting with 90 grit aluminum oxide and 100 psi air for one minute. Nozzle-to-sample distance was six inches, thickness equivalent to 2300-volt insulation. Note difference in abrasion!



Silco-Flex Insulation | Polyester Mica Tape | Asphaltum Mica Tape

● **Homogeneity** — *Silco-Flex* insulation is a void-free dielectric barrier vulcanized into a unified insulating wall. It maintains its homogeneity under extremes of differential expansion and contraction due to thermal cycling.



***Other Advantages*** include exceptionally good thermal stability and chemical inertness. *Silco-Flex* insulation is also a much better heat conductor than ordinary electrical insulating materials. Moreover, enclosures now required to protect windings from moisture and abrasion may be eliminated in many cases.

New *Silco-Flex* insulation is immediately available for all Class H form-wound coils and for Class A and B windings operating under selected service conditions. For complete information, call your Allis-Chalmers representative or write Allis-Chalmers, Milwaukee 1, Wisconsin.

A-4774

*Silco-Flex* is an Allis-Chalmers trademark.

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An outstanding record of successes in the elimination of corrosion . . . countless testimonials from industrial management on savings in time and material . . . this is proof of the benefits that ARco Field Service offers you . . . with advanced procedures and controlled rubber compounds.

No matter how large the tank or system, an ARco Field Service Unit insures you against corrosion. So, don't wait, ask us to take a trip. Write, wire, or call for complete details. Automotive Rubber Company, Inc., 12566 Beech Road, Detroit 39, Michigan.

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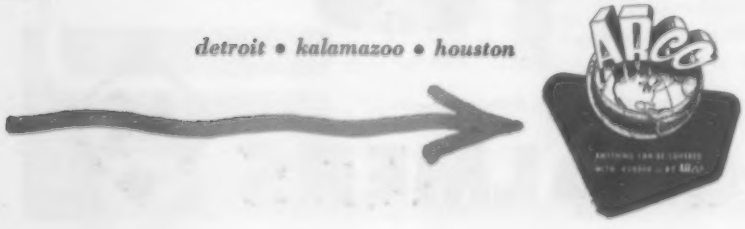



**FACTORY / LABOR RELATIONS NEWS**

*Begins on page 206*

between one course and another." And voluntary withdrawals from employment deprive New York employees of jobless pay. *(Angelo Malaspina)*

## Mediation Clause in Contract Helps

A mediator can help settle contract negotiation impasses, but often neither party to the contract is willing to ask for his services. To them, it looks like a confession of weakness. On the other hand, sometimes one of the parties is overanxious to get a mediator into the act — perhaps prematurely.

Joseph F. Finegan, director of the Federal Mediation Service, has stepped up with this suggestion: Include this clause in all union contracts, he says —

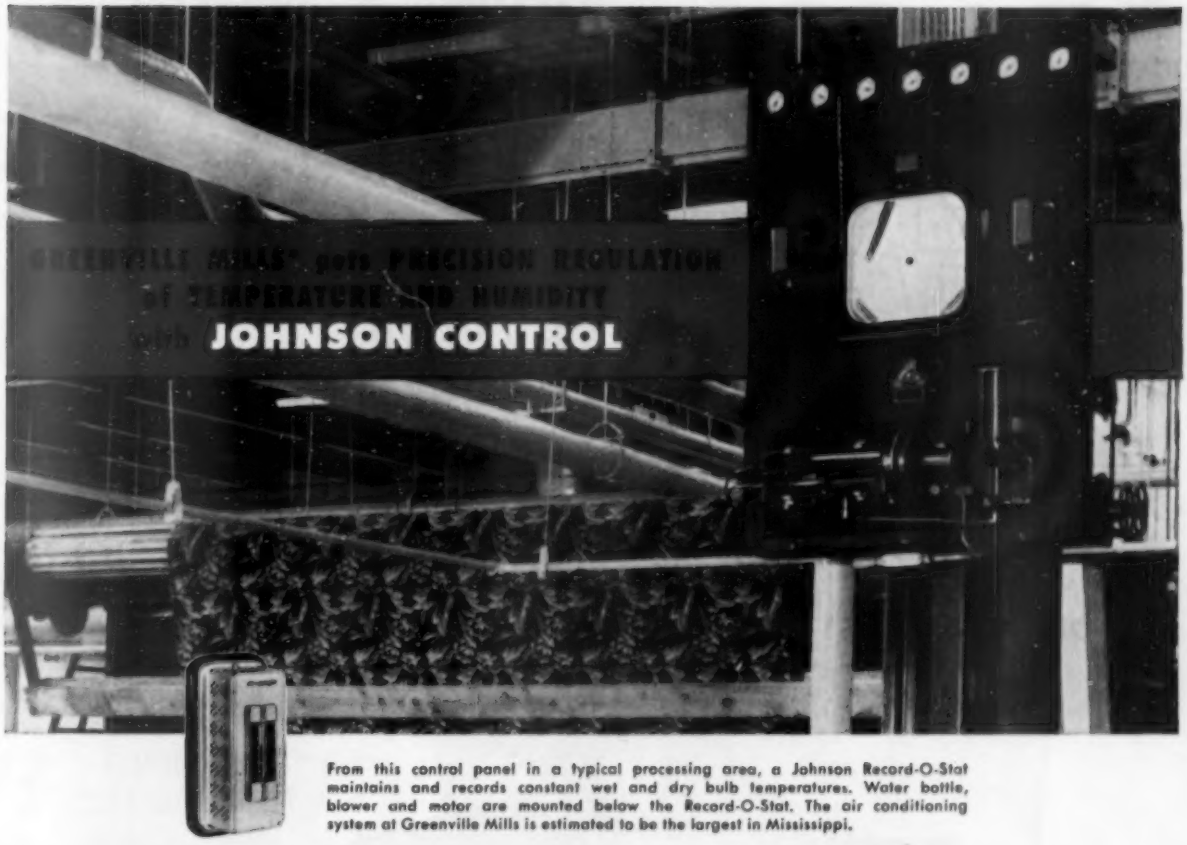
"Immediately upon receipt of . . . termination notice, the parties agree to enter into negotiations for further agreement. If they are unable to agree upon the terms of a renewal, either the Federal Mediation Service or the State Board of Mediation shall be invited to participate in the mediation of a proposed renewal agreement not later than 30 days before any expiration date of this agreement."

Finegan says that "by making the time of entry of a mediator by contract provision, the possibility of premature intervention by the mediator is eliminated and his entrance upon the scene would not be construed by either side as an indication of weakness."

As a matter of fact, the parties may specify some private party as mediator, with a sharing of the expenses.

## Keep Hidden Costs Out of Labor Agreement

The mystery has been taken out of fringe benefits. There may be disagreement among employers as to exactly what should be included




From this control panel in a typical processing area, a Johnson Record-O-Stat maintains and records constant wet and dry bulb temperatures. Water bottle, blower and motor are mounted below the Record-O-Stat. The air conditioning system at Greenville Mills is estimated to be the largest in Mississippi.

From raw wool to finished carpets—that's the story of the new Greenville Mills plant of Alexander Smith, Inc. Closely controlled temperatures and humidities, both for worker comfort and to safeguard sensitive processes, are essential to the efficiency of this modern plant. To maintain the exact conditions required in each area of the building, Greenville Mills depends on a specially designed system of Johnson Control. Here's how it works:

### PROCESSING AREAS

Processing areas are divided into eight zones—carding, spinning, twisting, reverse twisting, setting and threading, weaving (2), and finishing. Conditioned air is supplied by from one to four air handling units per zone. Accurately controlling the temperature and humidity in each zone is a Johnson T-1020 Two-Pen Record-O-Stat which maintains and records constant wet and dry bulb temperatures.

Each Record-O-Stat operates a Johnson Three-Way Mixing Valve on the chilled water coils, Johnson V-103 Steam Valves on the steam reheat coils, and a Johnson V-105 Steam Valve on the grid humidifier on each of the air handling units. To insure accurate response under all conditions, all valves are equipped with Johnson V-510 Pilot Positioners.

For quick warm-up, hot water can be circulated through the cooling coils. A single, convenient switch provides the changeover.

### SMOKE CONTROL FEATURE

A system of smoke dispersal is necessary in this windowless building. If smoke is detected in any unit, the return air damper automatically closes and the maximum outdoor air damper opens, increasing pressure inside the building and forcing the smoke out gravity roof ventilators. A manual switch at each control station will provide 100 per cent outdoor air at anytime.

### OFFICES

Ideal temperatures in offices and other comfort areas are maintained by Johnson Individual Room Thermostats which regulate the supply of conditioned air from multi-zone air conditioning units. During the heating season, Johnson Master-Submaster Control automatically varies the heat supply in accordance with outdoor temperature.

### OTHER SPACES

Other areas controlled include the laboratories, where control arrangements are similar to those in the processing sections. In the loading and stocking areas, strategically located Johnson Room Thermostats provide the desired temperatures by controlling Johnson Valves on ceiling-hung steam heating units.

Tens of thousands of buildings, of all types and sizes, depend on Johnson Control for the precision regulation of temperatures and humidities. In every case, simple or complex, the Johnson System is specifically designed to fit the exact needs of the individual building. Next time you have a problem, ask a nearby Johnson engineer for recommendations. There is no obligation. JOHNSON SERVICE COMPANY, Milwaukee 2, Wisconsin. Direct Branch Offices in Principal Cities.

*Greenville Mills, Inc., Greenville, Miss. (a division of Alexander Smith, Inc.). Mallett & Associates, architects and engineers, Jackson, Miss.; James F. O'Neil Co., heating and air conditioning contractor, New Orleans, La.

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TEMPERATURE & AIR CONDITIONING

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**FACTORY / LABOR RELATIONS NEWS**

*Begins on page 206*

in the classification, but all employers are aware of their costly nature. Now Nathan Belfer, Associate Professor of Economics, Pennsylvania State University, breaks into print with a new discovery—Hidden Costs in the Labor Agreement. He has in mind costs resulting from the wrong kind of:

*. . . Seniority clause*
*. . . Bumping clause*
*. . . Management rights clause*
*. . . Grievance procedure*
*. . . Technological change clause.*

In his article on the subject, appearing in Feb. 7 issue of "Current Economic Comment" published by the University of Illinois, he exposes the cost elements of these clauses. Although these costs have not been measured, Professor Belfer has done good job in alerting employers to their significance. A free copy of his article can be secured from Bureau of Economics and Business Research, 205 David Kinley Hall, Urbana, Ill.

## BRIEF BUT IMPORTANT

**What size for labor peace?** Does plant size have any effect on industrial relations? Are there more strikes — more severe ones — in large plants as opposed to smaller ones? Do people work better in small plants? For a factual study furnishing answers to such questions, put your hands on "Influence of Plant Size on Industrial Relations." It's published by the Department of Economics and Sociology Princeton, N. J. ($2). It resulted from a 2-year study of 82 plants in the Trenton area.

**Taxation without representation.** Forty-one employees of the Fairchild Engineering and Aviation Corporation of Hagerstown, Md., have raised a hue and cry about the $5 dues increase voted at the UAW convention. It's an unfair labor practice, they charged.

**Dishonesty discharge difficult.** When you think of firing an employee for dishonesty, be sure you can prove your case "beyond a reasonable doubt." An arbitrator rules


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REG. U.S. PAT. OFF.

PRESSURE PLATE BACK WIRING FOR GREATER WIRING SECURITY, SAFETY AND CONVENIENCE

Diagram at right shows how the Hubbell pressure plate mechanism is designed. The stripped wire, when inserted through the reinforced back wiring holes (left), locates between the two terminal plates which, as the screw is tightened, pressure-grip the wire securely (picture below).

the convenience of modern back wiring plus the safety of a pressure plate screw connection

Save-A-Splice . . .

Another important advantage of Hubbell pressure plate back wiring is the fact that a circuit may be extended using both back and side wiring. The same binding screw anchors both the wire inserted through the hole in back and the side-looped wire.

Twist-Lock No. 7582

Highest Grade HEAVY DUTY WIRING HUBBELL DEVICES

23HH55A

HARVEY HUBBELL, INC. DEPT. FM BRIDGEPORT, CONN.

FACTORY WAREHOUSE LOCATIONS ASSURE NATIONWIDE STOCK AVAILABILITY

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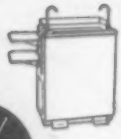
Precious Minutes Now!

FOR YEARS OF FUTURE SERVICE



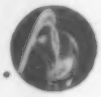
There's a Model to suit your specific need

Here, in our quality-control laboratory, an important routine check is being made to pre-determine thermostat efficiency. It is but one of many constant tests, using the very latest equipment, which assure that the various components of a Halsey Taylor Cooler meet the high standards of quality and performance we have established.

That's why leading industrial plants recognize the value of using Halsey Taylor Coolers or Fountains.

The Halsey W. Taylor Co.,
Warren, Ohio

HALSEY TAYLOR



Write for catalog or see SWEET'S

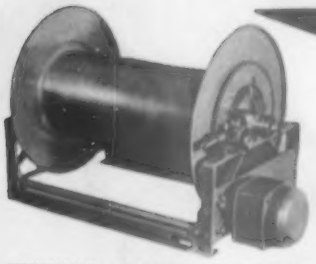
F-43

SPEED UP LIQUID HANDLING

for—
Chemical Processing
Vehicle Fueling
Fire Fighting
Cleaning
Production
and
wherever
hose
is used!

Hundreds of standard types and sizes. Also, custom built to your specifications

Save time!
Speed production!
Improve safety!
Save hose!
Stop waste!
with



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HANNAY HOSE REELS
CLIFFORD B. HANNAY & SON, Inc.
WESTERLO, NEW YORK

Send me complete details on Hannay Hose Reels to be used for _____

Name _____

Company _____

Address _____

CLIFFORD B. HANNAY & SON, INC.

835 Main St.
Westerlo, N. Y.


**FACTORY / LABOR RELATIONS NEWS**

*Begins on page 206*

that "preponderance of evidence is not enough in criminal cases." *(General Refractories Award)*

**Job openings with a string attached.** It's the law! Help-wanted ads in Rhode Island inserted by companies having labor trouble must have large type indicating this fact. Must be as large as the largest type in the ad.

**Time off — personal.** Says the AFL: About a third of their union contracts contain personal leave clauses, that is, time off for medical treatment, Christmas shopping, death or illness in the family and so on. And they'd probably like more.

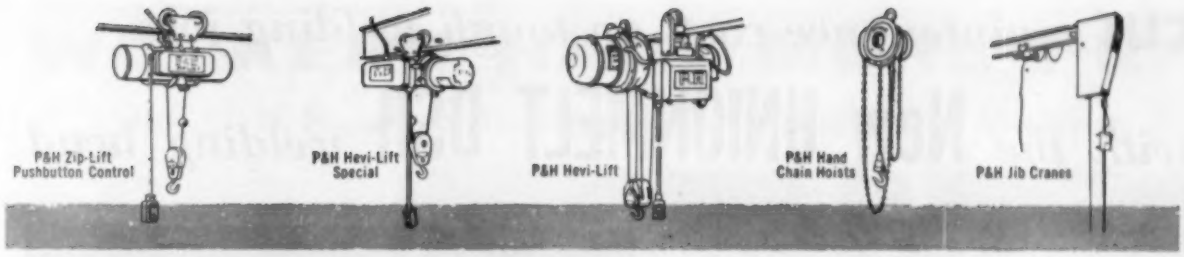
**No pay for voting.** Give employees two hours off in Illinois to vote (political elections, that is). This you must do, says the state Supreme Court. But you need not pay them for this time. That's depriving you of property without due process of law. *(Benjamin Mfg. Co.)*

## You Be the Arbitrator

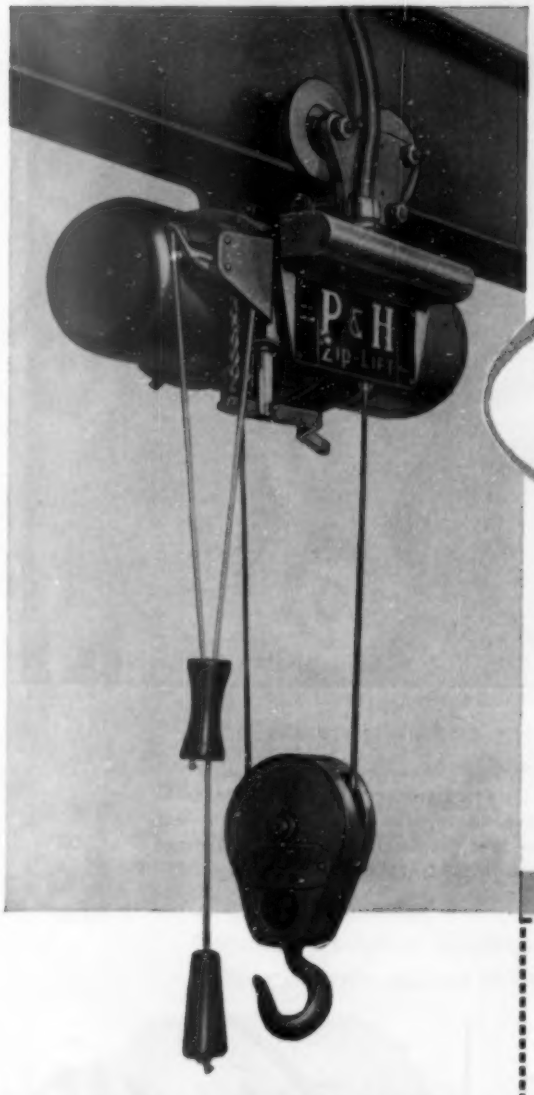
*Begins on page 82*

**THE AWARD:** Sam kept his job. If he had transferred from an "at work" status, he would have lost his seniority. Having taken the temporary work while on lay-off made all the difference. The arbitrator acknowledged the argument that this could lead to discrimination against union members. But he answered that he was bound to rule under the contract as written. If the union wanted special safeguards against discrimination, it should have got them in negotiation.

**CAUTION:** *The award in the case above is not an indication of how other arbitrators might rule in apparently similar cases. Arbitrators do not follow precedents. Each case is decided on the basis of the particular history, contract, testimony, and other facts involved.*




# *Here's News!* Now the P&H Zip-Lift Special gives you a wire rope hoist at electric chain hoist prices!




HERE'S another new hoist added to the most complete line in the business. And P&H has kept manufacturing costs down so that you can't afford to pass up this terrific value.

**Just take a look at the price list on the new rope-control Zip-Lift Special!**

| Capacity | Price |
|---|---|
| 250 lbs. | $145.00 |
| 500 lbs. | 194.00 |
| 1000 lbs. | 219.00 |
| 2000 lbs. | 224.00 |

Two disc brakes on every hoist. Ten feet of lift is standard — available in 14', 18', and 20' lifts at slight additional cost.

Get hold of your P&H Distributor. Ask him to give you the complete information on this new unit — the P&H Zip-Lift Special. If you're in too much of a hurry to wait, send the coupon in to us. We'll see that you get complete specifications by return mail. P&H Hoist Division, Harnischfeger Corporation, 4565 West National Avenue, Milwaukee 46, Wisconsin.

**Tear out and mail today!**

**P&H Hoist Division**
**Harnischfeger Corporation** 3859
**4525 West National Avenue, Milwaukee 46, Wisconsin**

Gentlemen: The new Zip-Lift Special sounds like a money-saver to me. Send me complete information as fast as you can.

Name _____ Title _____

Company _____ Address _____

City _____ ( ) State _____

**HARNISCHFEGER**

*the* P&H *Line*

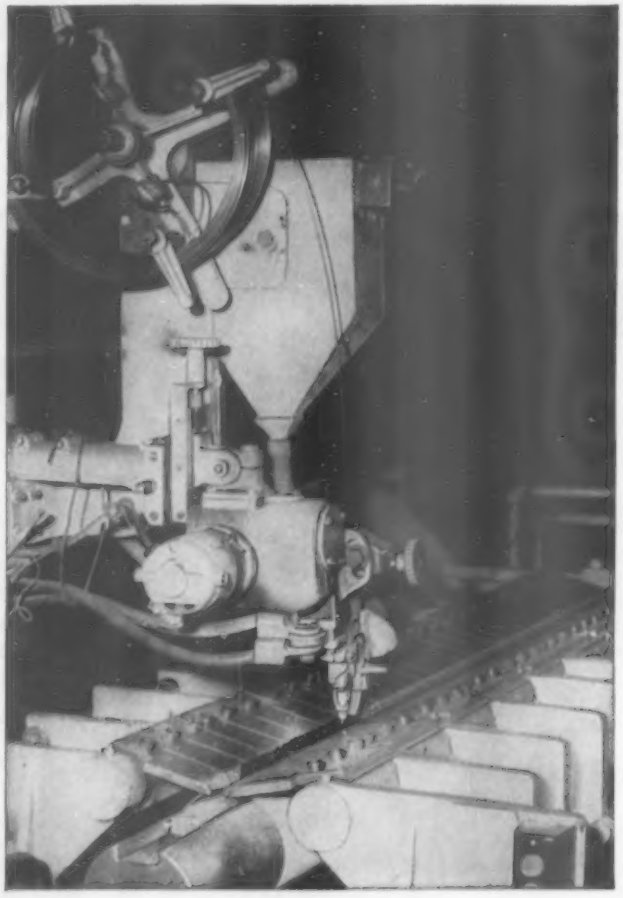
# CUT *maintenance costs on tough welding jobs*

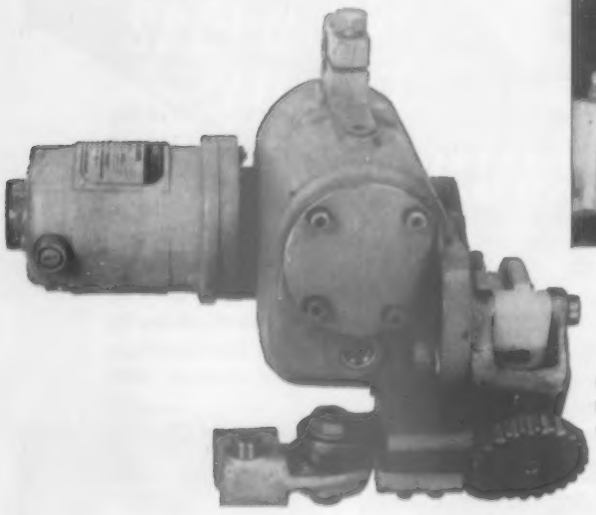
# *with the* New UNIONMELT DSH *welding head*

Trade-Mark

Here's the low cost, submerged melt welding head that saves maintenance costs on tough welding operations. The new UNIONMELT DSH head combines the flexibility of the lighter units with the ruggedness needed in heavy-duty welding machines. Large, sturdy gears and bearings give long, trouble-free service though work may involve frequent starts and stops and feeding heavy electrode wire. Simple controls and mounting arrangements make the DSH head easy to operate and maintain.

UNIONMELT welding joins thin metals at speeds up to 200 in. per minute or makes one-pass welds with a 3-inch penetration if desired. If you have a production job in your plant that requires high-quality welds made at high speeds, ask your nearest LINDE Office today for more information about UNIONMELT welding. A LINDE Engineer will be glad to help you plan your UNIONMELT installation for high-speed, production welding.





With the new UNIONMELT DSH head now available in five output speeds, you can select the best unit you need for making high-quality low-cost welds at the highest welding speeds.

**Linde Air Products Company**

**A Division of Union Carbide and Carbon Corporation**

30 East 42nd Street UCC New York 17, N. Y.

Offices in Other Principal Cities

In Canada: LINDE AIR PRODUCTS COMPANY

Division of Union Carbide Canada Limited, Toronto

(formerly Dominion Oxygen Company)

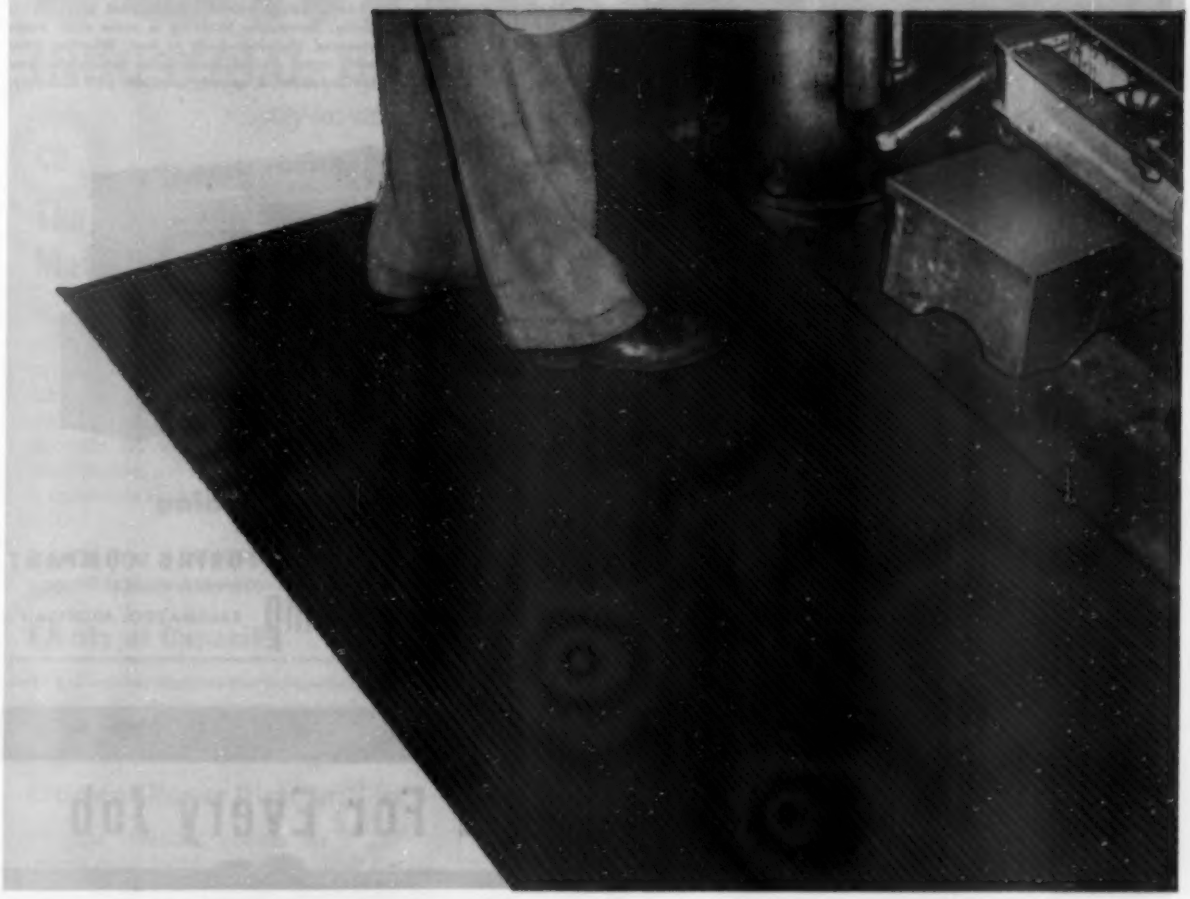
*The terms "Linde" and "Unionmelt" are registered trade-marks of Union Carbide and Carbon Corporation*

Linde

Trade-Mark

# WORKERS HAVE MORE PEP

## with U. S. Rubber Sponge Back Foot-Ease Matting



This matting puts a resilient cushion between feet and floor, reduces foot troubles caused by long periods of standing on hard floors. U. S. "Foot-Ease" conserves workers' energy, enables them to turn out better work. Tough layer of durable rubber compound is backed by a layer of springy sponge rubber. Designed for long wear. Firm footing is assured by corrugated or pyramid-pattern surface. Available in black, corrugated surface (Style P-2503) or pyramid surface (Style P-2504). Comes in 25-yd rolls, 36 inches wide. Obtainable from any of United States Rubber Company's selected distributors or one of the 27 "U. S." District Sales Offices, or write address below.

US RUBBER

*"U.S." Research perfects it..."U.S." Production builds it... U.S. Industry depends on it.*

**UNITED STATES RUBBER COMPANY**

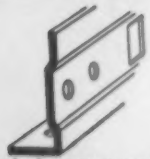
**MECHANICAL GOODS DIVISION · ROCKEFELLER CENTER, NEW YORK 20, N. Y.**

**Hose • Belting • Expansion Joints • Rubber-to-metal Products • Oil Field Specialties • Plastic Pipe and Fittings • Grinding Wheels • Packings • Tapes Molded and Extruded Rubber and Plastic Products • Protective Linings and Coatings • Conductive Rubber • Adhesives • Roll Coverings • Mats and Matting**

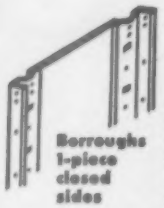
# BORROUGHS
## *UNITIZED flexi
# STEEL SHELVING

### Here's "value-plus" in modern shelving

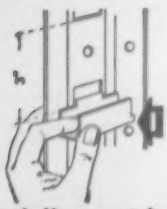
**No other shelving can be erected as speedily as Borroughs Unitized flexi Steel Shelving. No other shelving offers quicker shelf adjustment. Each individual unit is complete in itself . . . no part depends on unit next to it . . . any unit or shelf can be moved independently. Borroughs Shelving is rugged . . its heavy gauge rolled shaped-post gives extra strength and greater rigidity. Borroughs Shelving is more than posts and shelves . . . it is engineered shelving—built to last. Whether your storage requirements specify open, closed, bin-type or door units, you can bank on Borroughs for dependable, speedy erection, and economy.**



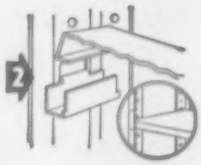
**Borroughs heavy gauge rolled shaped-post for open shelving gives extra strength.**



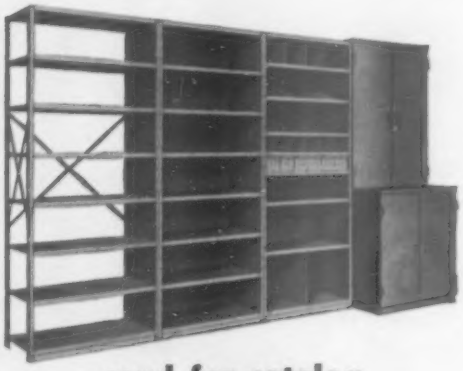
**Borroughs 1-piece closed sides for closed shelving . . saves erection time.**



**Insert shelf support bracket . . no fumbling with studs, bolts, nuts or lock washers.**



**Tilt shelf into support bracket . . and shelf is ready for loading.**



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**BORROUGHS MANUFACTURING COMPANY**

A Subsidiary of The American Metal Products Company of Detroit

3002 NORTH BURDICK amp KALAMAZOO, MICHIGAN



# There's A HOOD GLOVE For Every Job

**4705**
**NEOPRENE COATED**
Heavy-Duty yet Flexible

**PV-96**
**PLASTIC COATED**
Liquid Proof, Natural Fit Fingers

**R-43**
**NATURAL RUBBER**
Standard Weight, Curved Fingers

HOOD

*makes all types of work gloves — knit wrist, gauntlet, mitten.*

**HOOD RUBBER CO., Watertown, Mass.**

*a division of the B. F. Goodrich Company*

Write for FREE catalog — shows the RIGHT glove for EACH job.

RUBBER - NEOPRENE - PLASTIC COATED INDUSTRIAL GLOVES

# FIRST IN THE FIELD

# JUMBODUCT

## INDUSTRIAL UNDERFLOOR RACEWAY

**APPROVED BY UNDERWRITERS' LABORATORIES, INC.**

## The Heavy-duty System for Modern Plant Wiring

National Electric JUMBODUCT offers industry three times the capacity previously available, freedom from the hazards of overhead wiring, *plus* outstanding economy. It's designed to provide readily accessible electrical distribution for industrial locations at a minimum investment.

**You'll find a JUMBODUCT specification means:**

### Plenty of Capacity

4" x 4" cross section provides adequate room for electric wiring to banks of heavy production equipment.

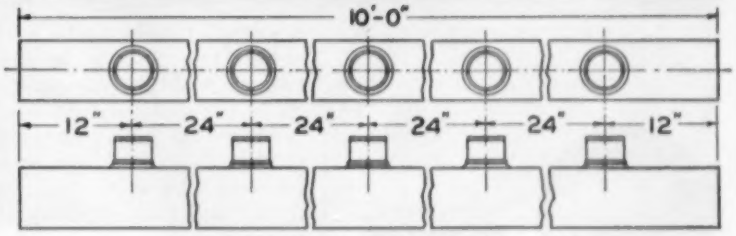
### Efficient Power Distribution

2" pipe threaded outlets every 24" permit exact location of equipment for most efficient production layout.

### Low Cost

Furnished in easy-to-handle 10' lengths (complete line with junction boxes and a full complement of fittings), JUMBODUCT can be quickly installed in the same simple manner as standard Nepcoduct.

Close proximity of inserts to finished floor makes access quick and economical. Investment in conductors is limited to today's need with ample area for tomorrow's expansion.




INDUSTRIAL NEPCODUCT—CAT. NO. 11055

### Safety

JUMBODUCT, protected against corrosion by Sherardizing plus a baked-on coating of acid-resisting enamel, is a completely grounded all-steel electrical system for protection of personnel and equipment.

Get the details on National Electric's newest all-steel, completely grounded industrial underfloor raceway. Write today for a free Engineering Data Book on NE JUMBODUCT.

*EVERYTHING IN WIRING POINTS TO*

## National Electric Products

PITTSBURGH, PA.

3 Plants • 8 Warehouses • 34 Sales Offices

**Ask these questions, too, when you judge a fluorescent lamp**

**Is its phosphor factory-controlled for color match?**

Westinghouse makes its own fluorescent lamp phosphors . . . to be sure of strictest uniformity. Thus *you* can be sure that the Westinghouse lamp you buy today will exactly match the Westinghouse lamp of the same color classification you bought yesterday or years ago.

**Are its electrodes built for longest lamp-life?**

Constant development of new and better ways to make fluorescent lamp electrodes has enabled Westinghouse to *triple* the life of its fluorescent lamps since 1948.

**Is it the correct type, size and color for the lighting job to be done?**

In the Westinghouse fluorescent family of 290 different lamps—including Slimline and Rapid Start—there's a type and size precisely right for every office, plant and merchandising application. Colors include seven different shades of "white" alone.

For the full story on how to get more for your money in fluorescent light, contact your Westinghouse Lamp Representative.

YOU CAN BE SURE...IF IT'S

**Westinghouse**

By **REX H. WILSON, M.D.,** Medical Director
The B. F. Goodrich Co.

# Vision and Age

**Eyes bother you in any way? If answer is yes, or you're over 40, see your eye doctor—and do so regularly.**

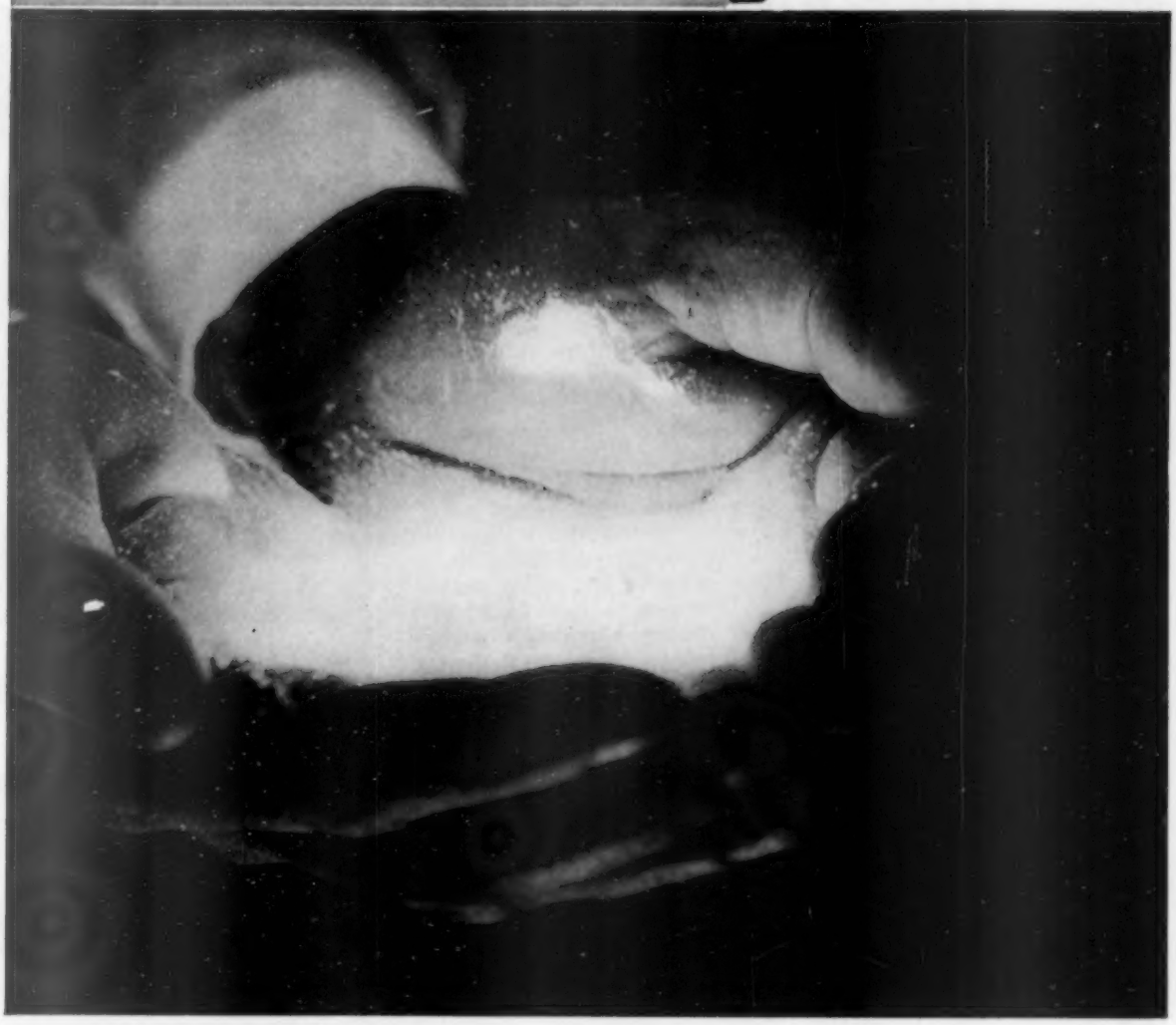
**HAVING DIFFICULTY** in seeing objects clearly from various distances? Ability to see is a measure of your actual age. As you grow older, the focusing point of images on the eye gradually recedes, causing you to hold reading material farther and farther from your eyes to see it.

Fortunately a physician specializing in diseases of the eye can help you. Not only can he detect diseases of the eye, but, by looking into the eyes, he can even detect certain diseases of the body such as high blood pressure, kidney disease, and diabetes. He can also fit you with corrective glasses which will make seeing easier. Maybe you will need bi-focals to see objects clearly both near and far. Or even tri-focals to take care of objects at a comfortable reading distance and objects at your working distance.

You should consult your eye physician any time your eyes bother you. In fact, you may hasten damaging your eyes by eye strain. At any age, headaches, blurring of your vision, difficulty in seeing should alert you to this possibility. And, once you start wearing glasses, you should have your eyes checked regularly. Your eyes can, and may, change, but your glasses cannot. Instead of helping you, they may become a hindrance. After 40 you should consult your eye doctor yearly, regardless of whether you wear glasses or not.

During the course of a routine eye examination on a 48-year-old man, it was found that he had a beginning cataract in the lens of each eye. Cataracts, which are a cloudiness of the lens, may be due to heredity, body infections, metabolic or glandular disorders, hardening of the arteries, or faulty diets. The eye physician referred this particular individual to a diagnostician who found that the cause of his trouble was an infected tooth. Fortunately, removal of the tooth stopped any

How to judge a fluorescent lamp ...point No. 1



ask about **HALO PHOSPHORS**

The "phosphor" in a fluorescent lamp is the light-producing coating inside the glass tube. Only if the phosphor successfully resists deterioration will the lamp—*1*) continue to give high light-output and—*2*) retain its original color to the end of its long life. Tops for deterioration-resistance among the different types of phosphors now in use are *Halo* Phosphors. Westinghouse (and only Westinghouse) uses Halo Phosphors throughout its entire fluorescent lamp line.

YOU CAN BE SURE...IF IT'S Westinghouse

HOW YOU SAVE . . .

**. . . getting drier Compressed Air**

● Save the cost of cooling water and you save the price of the Niagara Aero After Cooler (for compressed air or gas) in less than two years.

Extra, for no cost, you get drier compressed gas or air for your process. You get better operation and lower costs in the use of all air-operated instruments, machines, or paint sprays. You save expense for piping, pumping, water treatment and disposal. You get the use of badly needed water elsewhere in your plant.

Niagara Aero After Cooler cools compressed air or gas (evaporatively) below the temperature of surrounding atmosphere, with no further condensation in your air lines.

Write for complete information; ask for Bulletin No. 98, or contact nearest Niagara Engineer if you have any problem involving the industrial use of air. Address Dept. F.

NIAGARA BLOWER COMPANY
405 Lexington Ave., New York 17, N.Y.
District Engineers
in Principal Cities of U. S. and Canada


*Begins on page 222*

further progress of the cataracts.

If you have progressing cataracts, your eye physician can, at the proper time, surgically remove them and restore satisfactory vision with glasses to you. A friend of mine who is president of a large company has had cataracts removed from both his eyes. He now drives his own car and plays a fine game of golf.

There is a gradual decrease in visual acuity and a narrowing of the fields of vision with increasing age. Also, as you grow older you lose your ability to see in the dark. However, this loss will not be too troublesome until you reach about 80 years of age.

Some people with poor eyesight during early years experience a marked improvement in vision, or what is often called "second sight," at about age 60. This is especially true of near-sighted persons. As we grow older the lens of the eye extends toward the front of the eye. This makes the focusing of images on the retina or screen of the eye easier and thus improves visual acuity.

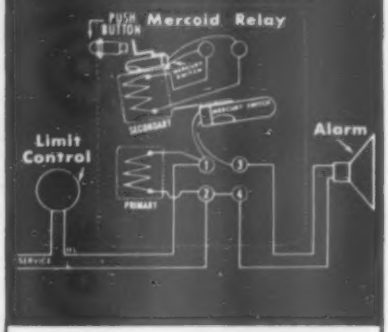
At about 50, however, most people will begin to notice an increasing haziness of the cornea—the transparent part of the eye that covers the iris and pupil. This change, along with a gradual clouding of the fluid of the eye, causes an impairment of vision. The retinal screen of the eye contributes to this weakening of vision, too, as it loses its reflecting power as the arteries harden.

It is interesting to note that we have to learn to see *mentally* what we can see *optically* with our eyes. A baby can see an object, but he must then learn to recognize the object and remember what it is. But as we grow older, this visual memory lessens. An older person not only may have failing vision because of eye defects, but he may also be losing his ability to *recognize* what he sees. Plant workers on jobs requiring fine visual awareness and coordination should be tested for visual ability regularly—say once a year.

*Why settle for 50 years when you could have 100?*

MERCOID®
MERCURY SWITCH EQUIPPED
RELAY

for Audible or Visual Alarm




The control which senses the alarm circuit is connected in series with the primary coil of the relay. The alarm control closes its circuit to supply current to the relay primary coil and through the normally closed mercury switch of the relay to the Audible or Visual Alarm. Pushing the manual button of the relay (or through a momentary contact by a remote switch connected to the pilot circuit) causes the secondary coil to move upward, opening the normally closed mercury switch and stopping the Alarm. A lock circuit in the relay holds the alarm circuit open as long as current is supplied to the primary coil of the relay. When the alarm control opens its circuit interrupting the current to the relay primary coil, the magnetic repulsion holding the relay secondary coil up is interrupted and the secondary coil drops from its own weight. The alarm circuit sequence is thus reestablished automatically and is ready for another operation at the demand of the alarm control.

*Available for 115, 230 or 440V. A.C. current or similar D.C. voltages.*

**Our engineers are at your service—send in your control problem or**
WRITE FOR BULLETIN CA-8R

THE MERCOID CORPORATION
4211 Belmont Ave., Chicago 41, Ill.

# NEAT WAY TO PLAY SAFE: JAL-TREAD FLOOR PLATE

Jal-Tread floor plate combines the strength and durability of high quality steel with a neat, distinctive checkerboard pattern scientifically designed for *safety*.

Whatever your application . . . in new construction . . . new equipment . . . or replacement jobs, Jal-Tread will assure you of these advantages:

**Safe Footing**—300 miniature squares per square foot—all of uniform height—provide maximum linear friction surface that protects you against lost-time accidents.

**Easy Fabrication**—The Jal-Tread straight line pattern simplifies welding, flanging, shearing, bending, punching, and drilling operations. Experience shows that Jal-Tread can be cold-formed on standard plate bending machines.

**Easy Cleaning**—The Jal-Tread straight line gutter pattern permits quick, thorough sweeping and draining in any direction.

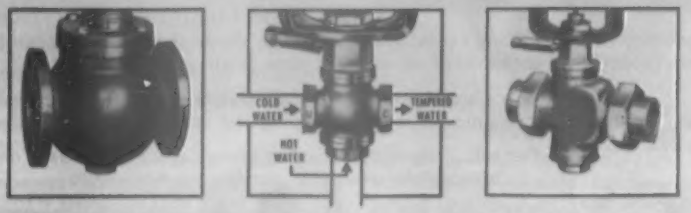
For safe, long-lasting flooring always specify J&L Jal-Tread . . . *it's available at leading distributors everywhere.*

*Jones & Laughlin*
STEEL CORPORATION — *Pittsburgh*

see our catalog in
ARCHITECTURAL FILE
or write for copy

# POWERS No. 11 Self-Operating TEMPERATURE REGULATOR

**Automatically holds temperature constant at the right point. Prevents losses caused by wasteful OVER-heating.**

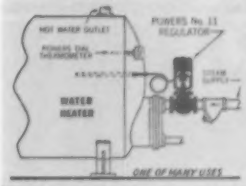



**Various Valve Bodies and Inner Valves are available.** Single and Double Seat Valves thru 2" have rugged bronze bodies with bronze union connections for quick, easy installation. Bulletin 329 gives information about all types.

(c33)

## Why It Gives BETTER CONTROL and Saves More Money

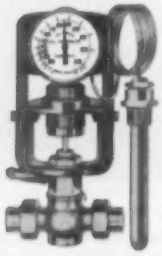
**Often repays its cost 3 to 6 times a year when used on:**




Water Heaters — Industrial Processes — Heat Exchangers — Fuel and Crude Oil Heaters — Air Compressors Diesel Engines

## ONLY POWERS No. 11 REGULATOR Offers ALL These Advantages

- **Simple, sturdy construction.** Materials used are corrosion resistant.
- **Powers bellows has 50% more power** than used in the majority of regulators. The heart of a self operating regulator is its bellows. Powers with its 50% greater effective area gives better control and its durable 2 ply bellows outlasts ordinary single ply bellows.
- **Valve stem lubricator** with silicone grease aids easy movement of highly polished stainless steel valve stem and reduces drying out of packing.
- **BETTER CONTROL** results from Powers powerful bellows and minimum of valve stem friction.
- **60°F. temperature ranges** available with accuracy of ±1°F. on some processes and 2 to 3°F. on others.
- **Rugged bronze valve bodies with bronze union connections,** for single and double seat valves thru 2", reduce installation time and labor. Larger sizes have flanged iron body valves.
- **Powers Nationwide Service and 24 Hour Delivery** in the U.S.A. are important time and money saving advantages.



- **Indicating Regulator** with easy to read 4" dial thermometer helps adjust the regulator and check temperature at the bulb. Various dials and ranges are available.

**Right type and size of valve is important for good control.** May we help you make the right selection? Benefit from POWERS more than 60 years experience with self-operating regulators.

*Call our nearest office or write us direct for Bulletin 329.*

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**Automatic Temperature and Humidity Control**

Established 1891

**BALL BROTHERS COMPANY, INC.**, Muncie, Ind., glass container manufacturer, achieves 80% "in-use" time for its vehicles (way above estimated national average of approximately 55%). The roving foreman uses G-E 2-way radio to coordinate activities of all trucks operating between 17 warehouses.

# New high reported in material handling truck utilization

**INSTALLATION** of General Electric 2-way radio units on Ball Brothers' vehicles, which transfer products from warehouses to rail and truck loading docks, boosted their utilization to 80%. Because there's immediate communication between vehicles and a roving foreman, rush consignments really *move*.

**THE SHIPPING, WAREHOUSING AND MATERIALS** handling superintendent can contact his roving foreman *instantly, at any time.* He also can use the radio system to contact other key personnel around the 70-acre plant area, from the transmitter in his office.

**G-E INDUSTRIAL 2-WAY RADIO** may be operated from any of the five DC voltage systems used by materials handling vehicles. Converters are used by G.E. for installations on 24, 32 and 64 volt trucks. These converters have been specifically designed to provide optimum radio performance at all voltages between peak and minimum operating battery charge conditions. The General Electric unit is also available for operation from 117-volt AC power.

2-WAY MOBILE RADIO

FREQUENCY STABILITY & SELECTIVITY *guaranteed for life!*

● **Investigate the outstanding versatility, sturdy construction and low maintenance of G-E industrial mobile radio. Write for FREE booklet ECR-106A, *General Electric Co., Section X6585, Communication Equipment, Electronics Park, Syracuse, N. Y.***

*Progress Is Our Most Important Product*

GENERAL ELECTRIC

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### KNOW YOUR LOAD!

Today, doubtful truck weights are more costly than ever . . . affecting your dealings with customers, with vendors, with highway enforcement officials.

*New* TOLEDO Hi-Weigh Truck Scales are engineered for today's heavy duty needs . . . choice of two-section, four-section or axle load in full range of models. Long-life accuracy assured by Toledo double pendulum mechanism . . . self-gauging replaceable pivots . . . parallel link suspension bearings . . . easy-to-operate unit weights . . . automatic indication with the famous Toledo dial. Send for literature, form 2417-A. Toledo Scale Company, Toledo 1, Ohio.

### HI-WEIGH AXLE LOAD SCALES

These Toledos help you check load distribution as well as total weight. Economical shallow pit installation. Choice of 20 ton capacity with 8′ x 10′ platform or 30 ton with 10′ x 10′ platform. Toledo dial offers quick, accurate weighing . . . outstanding dependability.

## 60 TON—4 SECTION—60 FT.
### TOLEDO HI-WEIGH TRUCK SCALES

These BIG four-section scales are built to weigh the heaviest and largest highway vehicles. In them you get the capacities and platform lengths required to meet needs today . . . and tomorrow. They are designed for economy of installation and long-life durability in heavy duty use. All Toledo Hi-Weigh Scales available with Toledo Printweigh for recording weights on tickets, strips, or sheets.

### NEW ECONOMY IN INSTALLATION

Toledo engineering has integrated lever, weighbridge, and pit design to achieve high strength combined with economical, long-life installation.

SERVICE Factory-Trained 200 Cities

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Headquarters for SCALES


**FACTORY / CATALOG NEWS**
*Begins on page 134*

To get these catalogs, circle item numbers on the Reader Service card next to back cover.

Manual LP No. 3 (40 pages). Tables of ratings, permissible loads, ratios. Dimension diagrams. *Foote Bros. Gear and Machine Corp.*

**18—Mechanical Seals.** Package-type devices for use on rotary shafts at pressures to 150 psi. are featured in Bulletin AD-150. Sectional views, charts, and diagrams illustrate features, tell how seal works. Installation and application data. 8 pages. *Garlock Packing Co.*

**19—Ball Bearings.** Booklet covers units for supporting line shafting, pillow blocks, hanger boxes, pump shafts, other power transmitters. Mounting directions, load ratings, housing bore and shaft limits, interchangeable sizes. 18 pages. *Marlin-Rockwell Corp.*

**20—High-Speed Couplings.** Bulletin No. 52 explains how they're designed, constructed of special materials, machined, and tested by a new balancing method to suit them for high-speed applications. Includes recommended service factors. *John Waldron Corp.*

**21—Fluid Drive.** Two bulletins on a general purpose unit. One covers advantages and applications, components and operation, dimensions and arrangements. The other is a handy selection guide for variable and constant torque loads. *American Blower Corp.*

**22—Oil Seals.** For bearing protection and other sealing problems, consult this 28-pager on all-purpose, split, molded and extruded oil slingers; end face and outside lip seals. Close-up photos and detailed drawings. Installation hints. *Johns-Manville Corp.*

**23—Vari-Pitch Sheaves.** Bulletin 20B6082C describes stationary or motion control types for speed variations to 76%; capacities of 1-600 hp. Includes ball bearing motor base for use with motion control drives. *Allis-Chalmers Mfg. Co.*

*Turn the page*

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THE MACHINE TOOL SHOW
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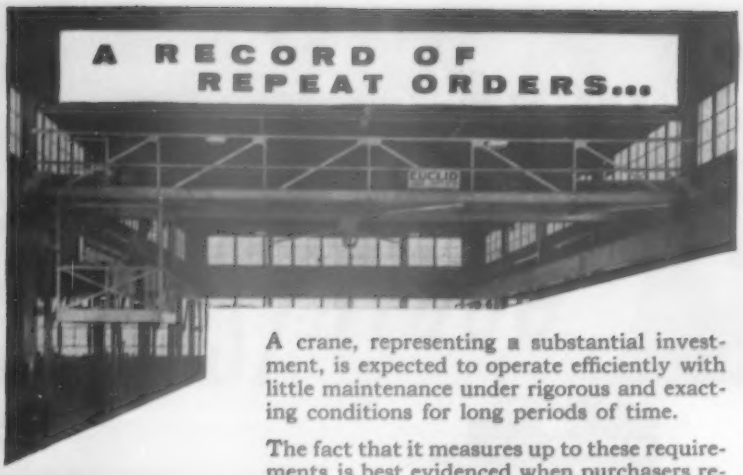


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The fact that it measures up to these requirements is best evidenced when purchasers return to the same manufacturer when additional cranes are needed.

We are in a position to submit what we sincerely believe to be an unexcelled record of repeat orders as evidence of the continuing high quality and tangible value of Euclid Cranes.

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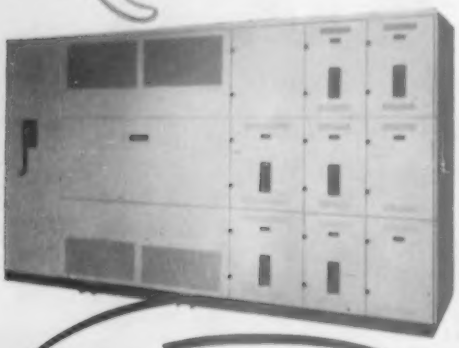
**1364 CHARDON ROAD**
**CLEVELAND 17, OHIO**

"It ain't tin!"

**... says the man who installs a**
**NELSON UNIT SUBSTATION**



Nelson unit substation with incoming load break interrupter switch, 500 kva air-cooled transformer and low voltage main and branch breakers.

To protect the fine components that form the operating heart of a Nelson unit substation, we build heavy-duty steel enclosures that are strong and solid throughout. Extra-heavy steel channels provide a firm base for the assembly.

Nelson unit substations are manufactured with air, oil or non-inflammable, liquid-filled transformers; and, built integrally with these transformers, are Nelson switchgear, motor control centers and all-in-one substations.

Maximum voltages from 13,800 volts primary to 600 volts secondary.

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**24—Pneumatic-Hydraulic Power Transmission.** Two offerings: an 8-pager (IC-2.3) on fluid power cylinders that operate on 500 psi. oil, or 200 psi. air; a 4-pager (IC-2.2) on systems and components (cylinder, valve, regulator). *National Pneumatic Co.*

**25—Magnetic Transmission.** Bulletin 226-D is divided into sections on torque considerations, magnetic clutches, clutch-brakes, and brakes. Includes selection data, dimensions, specifications, photos, and cutaway diagrams. 8 pages. *Stearns Magnetic Inc.*

## PLANT HOUSEKEEPING

**26—Building Cleaning.** Guide to latest scientific, labor-saving techniques. 45-page manual covers 69 cleaning and maintenance jobs, with how-to-do-it photos. How to seal, finish, wax all types of floors; maintain cleaning equipment. *Penetone Co.*

**27—Floor Machine.** Bulletin 551 details features and advantages of a unit that sucks up dust, dirt, lint, trash from large floor areas without stirring up dust. Compares "Floormobile" with other methods. Includes case histories. *Handling Devices Co.*

## ELECTRICAL

**28—Switches.** Catalog 5509 contains 48 pages of useful information on controllers for nearly every application satisfied by manually operated control. Drum, foot, and limit switches. Connection diagrams. *Furnas Electric Co.*

**29—Liquid Rheostat.** An enclosed unit for stepless secondary control of wound rotor motors is featured in Bulletin 14B8231 (8 pages). Suggests applications, especially for regulation of variable torque. *Allis-Chalmers Mfg. Co.*

*Turn the page*

*No matter what's thrown at them...*

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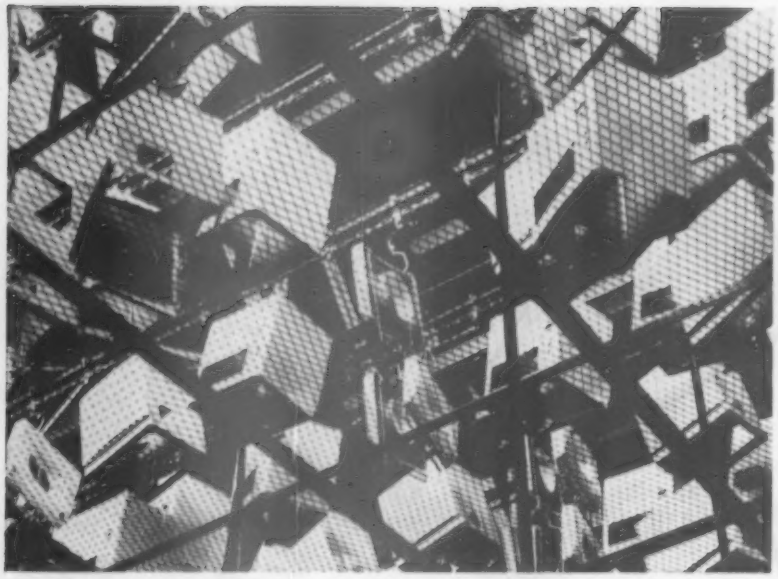

# "Floating inventory"

## on MHS overhead conveyor feeds appliance assembly lines

*The MHS Monoveyor shown above does a double job. It's a storage conveyor and a feeder for the assembly lines.*

*Finish-painted parts—jackets, tops, doors, etc.—are carried here in moving storage, off the floor and protected from damage. At assembly lines, the conveyor dips to working level and parts are removed as needed.*

*Capacity of the Monoveyor allows sheet metal and finishing departments to operate at their most efficient rate, independent of assembly line speed.*

• • •

MHS Monoveyors can meet almost every industrial requirement. They carry parts from operation to operation, move stock to storage and out of it, carry parts through spray, dip or washing operations, through ovens or sand blast, through final assembly, deliver completed units to shipping. Monoveyors can be engineered to handle any size, weight, and shape of load. Loading, unloading and transfer can be designed for automatic operation.

MHS Monoveyors are long-service, low maintenance, high efficiency production tools. We believe they are demonstrably the finest overhead conveyors on the market.

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**30—Motors.** Bulletin SDA-155 covers a line of ½-30 hp. motors—single-phase, polyphase, and d-c. Selection and ordering hints. Data on enclosures, special mountings and modifications, fractional integral hp. frame sizes. 8 pages. *Peerless Electric Co.*

**31—Small Motor Switches.** A complete line of toggle, rotary, door-operated, pushbutton, and automotive types are covered in this 14-pager. Complete tables of ratings and a handy selection chart. Photos and dimension data. No. EC-79. *Cutler-Hammer, Inc.*

## AIR HANDLING

**32—Unit Heaters.** Propeller fan types are featured in Publication B-1720. Sections on construction features, steam and hot water capacities, selection and application, mounting height and throw, wiring and piping diagrams, dimensions. 24 pages. *Warren Webster & Co.*

**33—Dehumidifiers.** Booklet discusses problem of dehumidification of compressed air and gases. Tells how to calculate moisture load. Describes water-cooled, refrigeration-cooled, sorption types. Applications and systems. 10 pages. *Desomatic Products, Inc.*

## LUBRICATION

**34—Machine Tools.** Centralized oil and grease and meter-flow oil circulating systems for automatic lubrication of machine tools are discussed in Bulletin 5410. Covers components, applications. *Trabon Engineering Corp.*

**35—Ball and Roller Bearings.** Do's and don'ts—12 of them—to prolong life of bearings are listed in Bulletin 506. Discusses lubrication and maintenance; storage and handling of lubricants. *New York & New Jersey Lubricant Co.*

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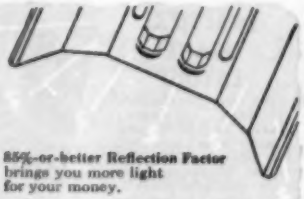
**More Upward Light** reduces brightness contrast, increases seeing comfort, minimizes eye fatigue.



**85%-or-better Reflection Factor** brings you more light for your money.

**All White Porcelain Enamel Reflectors** support better visibility conditions, as well as encourage better housekeeping.

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*when all things are considered, the Better Lighting Choice is*

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**FACTORY / CATALOG NEWS**

*Begins on page 134*

To get these catalogs, circle item numbers on the Reader Service card next to back cover.

**36—Lubrication Pumps.** Four bulletins describe double-acting hydraulic, single-acting hydraulic, single-acting pneumatic, cam-driven mechanical units. Illustrate oil and grease reservoir assemblies. Specs, dimensions, capacities. *Trabon Engineering Corp.*

## MATERIALS HANDLING

**37—Conveyors.** Among the types covered in this 12-pager are gravity wheel, aluminum wheel, gravity roller, and power belt conveyors; plus accessories that add to their usefulness. Specs, diagrams, installation photos. Form GC-54. *Speedways Conveyors, Inc.*

**38—Wagon Carrier.** Two bulletins describe a self-propelled unit useful for yard maintenance, materials handling, crane work, excavating, trenching, backfilling, grading. One covers crawler mounting; the other shows "Gradall" at work. *Warner & Swasey Co.*

**39—Overhead Cranes.** 32-page reference manual contains more than 80 photos showing typical applications ranging from ¼-ton hand-operated units to 350-ton giants, including fully automatic types. Helpful data on installations. *Moffett Engineering Co.*

**40—Tractors.** Crawler and wheel-type units for all-around service are featured in this 20-pager. In addition, 24 attachments for a variety of handling and maintenance jobs are described and illustrated. Specifications and photos of the tractors. *John Deere.*

**41—Truck Batteries.** Booklet discusses seven advantages of using batteries to operate your trucks. Contains electrical data, weights, and dimensions of standard assemblies for driver-ride, walkie, and midge trucks. Connector specs and mounting diagrams. 20 pages. *Thomas A. Edison, Inc.*

*Turn the page*


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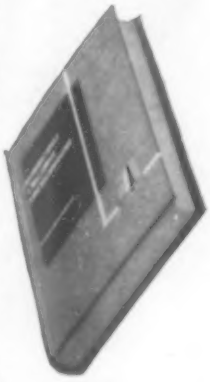

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**Step up production, increase employee safety in YOUR company**—with this aid to efficient plant layouts! These *cost-saving* methods streamline materials-flow, rearrange men and machines for peak effectiveness, eliminate waste, confusion and duplication. Scores of such practical ways for boosting output are contained in this book. It shows you *exactly* how to *plan, install,* and *sell* precise layouts for all types of factories. **By Richard Muther, Management Engineer, The Vendo Company, Kansas City. 359 pp., over 200 illus., $12.00**

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TRAK-RAK cuts cost of

# BAR STOCK HANDLING 66.3%

**employing 2 men where 4 were formerly required . . . with 100% selectivity of material**

An improved, simplified, and radically different method of handling bar stock is now in use which replaces the usual difficult and costly method of storing bar stock in pigeon hole racks and removing only a bar or two at a time.

Utilizing the TRAK-RAK Crane System, bar stock is assembled in unit loads placed in containers or baskets which are stored in fabricated tree-type racks on each side of narrow aisles. To remove one or more bars, the container is lowered to the floor, the bars removed and the container with the remaining bar stock placed back in its designated location in the storage racks. The entire movement is one-man, pendant push-button controlled from the floor and it is now possible for the saw man to select his own material and place it directly upon the saw table.

This TRAK-RAK Crane System operates in a 4 ft. 6 in. aisle and stores the material eleven high. The same crane incorporates interchangeable forks which allows the crane to handle palletized material as well as bar stock in the same area.

**Write today for TRAK-RAK applications** —a 20-page illustrated booklet explaining the TRAK-RAK Handling and Storage System; illustrates and describes installations for handling many diverse materials in fourteen widely different industries.

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**FACTORY / CATALOG NEWS**

*Begins on page 134*

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**42—Casters and Wheels.** Information on a complete line for light through heavy-duty use on all types of portable equipment, plus special types to supplement standard units. Selection charts for specific load and floor conditions. 28 pages. *Rapids-Standard Co.*

**43—Warehousing System.** How to enjoy advantages of bulk picking and retain desirable features of order picking? Brochure explains an automatic system utilizing electronically controlled conveyors. Illustrates typical warehouse layout. *Walter Kidde Constructors, Inc.*

**44—Straddle Dump Carrier.** Bulletin covers performance characteristics, construction details, specifications of a 20,000-lb. capacity carrier. Describes hydraulically operated dumper, giving specs of container so you can build it locally. *Clark Equipment Co.*

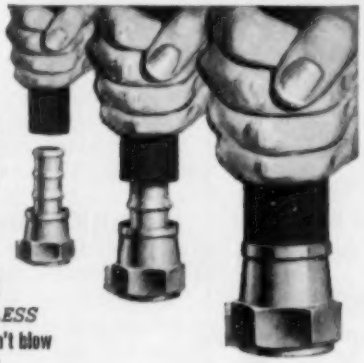
**45—Magnetic Equipment.** Bulletin No. B-207 illustrates 12 types for conveying, holding, controlling, separating, retrieving, and purifying ferrous materials. Tells what each will do, giving construction and dimension details. 6 pages. *Eriez Mfg. Co.*

**46—Overhead Cranes and Monorails.** Case history of a jet engine plant. Ten photos show their use in blade diaphragm shop, fabricating shop, heat treating and pickling department, outside receiving, spare parts packaging. 6 pages. Bulletin M-29. *Whiting Corp.*

**47—Sealed Casters.** Bulletin describes a caster that seals in grease; seals out dirt, debris, water, other foreign matter. Pictures light-, medium-, and heavy-duty models, giving complete specifications. Cutaway diagrams included. *Albion Industries, Inc.*

**48—Electric Vibrators.** Eccentric weight and electro-magnetic types are featured in Catalog No. 11; plus vibrating tables and pneumatic

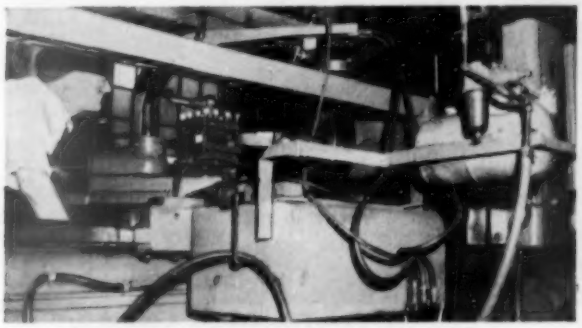
# Revolutionary New Hose Line *Speeds Maintenance!*



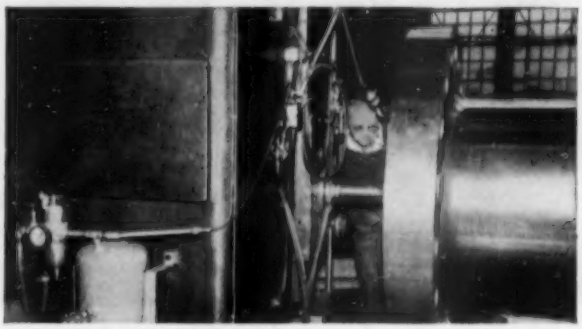
Hose line assembly couldn't be quicker or easier! For quick replacements, just cut Aeroquip 1525 hose to required length and PUSH it on the *SOCKETLESS* fittings . . . they won't blow off, even at 250 p.s.i.

Patent Applied For

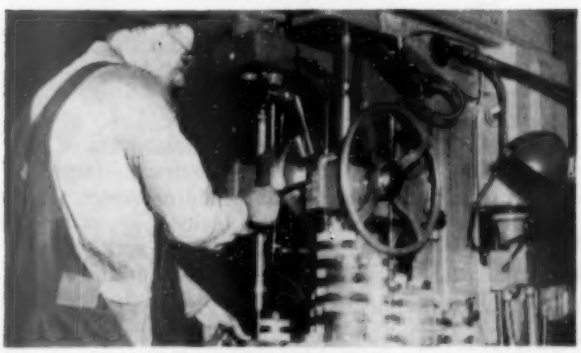
Aeroquip *SOCKETLESS* fittings and hose were used to make the coolant line on this engine lathe. This hose line can withstand vibration and constant flexing.



Two of the original three hose lines on this tracer lathe failed and were replaced with Aeroquip hose lines made right on the spot.



Lube lines, like these used on this boring machine, are easy to make when you have Aeroquip 1525 hose and *SOCKETLESS* fittings on hand.



Here Aeroquip 1525 hose and *SOCKETLESS* fittings carry the pressure coolant that lubricates this double drill press.

**AEROQUIP**

**SOCKETLESS**

**FITTINGS AND HOSE**

are available in ¼, ⅜, ½ and ⅝" sizes. A small supply assures quick replacements for fuel, oil, water, air and coolant lines on all industrial equipment. See your Aeroquip distributor, or write us for complete information.

These are a few of the Aeroquip *SOCKETLESS* applications in a single plant (name on request).

Aeroquip

REG TRADEMARK

**AEROQUIP CORPORATION, JACKSON, MICHIGAN**

LOCAL REPRESENTATIVES IN PRINCIPAL CITIES IN U.S.A. AND ABROAD • AEROQUIP PRODUCTS ARE FULLY PROTECTED BY PATENTS IN U.S.A. AND ABROAD

# on your nut setting operations-

**for maximum economy**

Apex extensions and impact sockets, built of high carbon electric furnace alloy steel, are specifically designed for continuous, hard usage. When wear finally does occur, you replace only the worn part—socket or extension—your tool replacement costs are kept to a minimum.

**for maximum torque**

Apex straight (one-piece) nut setters are also built of high carbon electric furnace alloy steel. They have no joints, locking devices or movable parts. This one-piece design eliminates backlash and vibration . . . full torque is developed, as power is applied directly from the tool to the work.

**for every nut setting operation**

Apex produces a complete line of impact sockets, extensions, adapters and universal wrenches, each designed and built for a specific nut setting operation. Choose from more than 5,000 stock types and sizes . . . or tell us about your special nut setting problem and we'll work right with you to help find the solution. Catalog 29 is available on request—please use your company letterhead.

APEX TOOLS

sockets, extensions, adapters

THE APEX MACHINE & TOOL COMPANY
1025 S. Patterson Blvd. • Dayton 2, Ohio


**FACTORY / CATALOG NEWS**

*Begins on page 134*

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vibrators. Shows them in action. Contains useful information on mounting and installation. 8 pages. *Cleveland Vibrator Co.*

**49—Belt Conveyors.** Bulletin 105 describes features of conveyors for handling bulk materials, portable for bags and boxes, table-top and floor-to-floor types. Dimension drawings. Still-life and action photos. Accessory information. 8 pages. *Belt Corp.*

## CONTROLS

**50—Automatic Control Systems.** Bulletin S-10 offers services for designing, purchasing, constructing, and starting up a system to suit your needs. Presents case histories of different installations in various industries. 12 pages. *Automatic Temperature Control Co.*

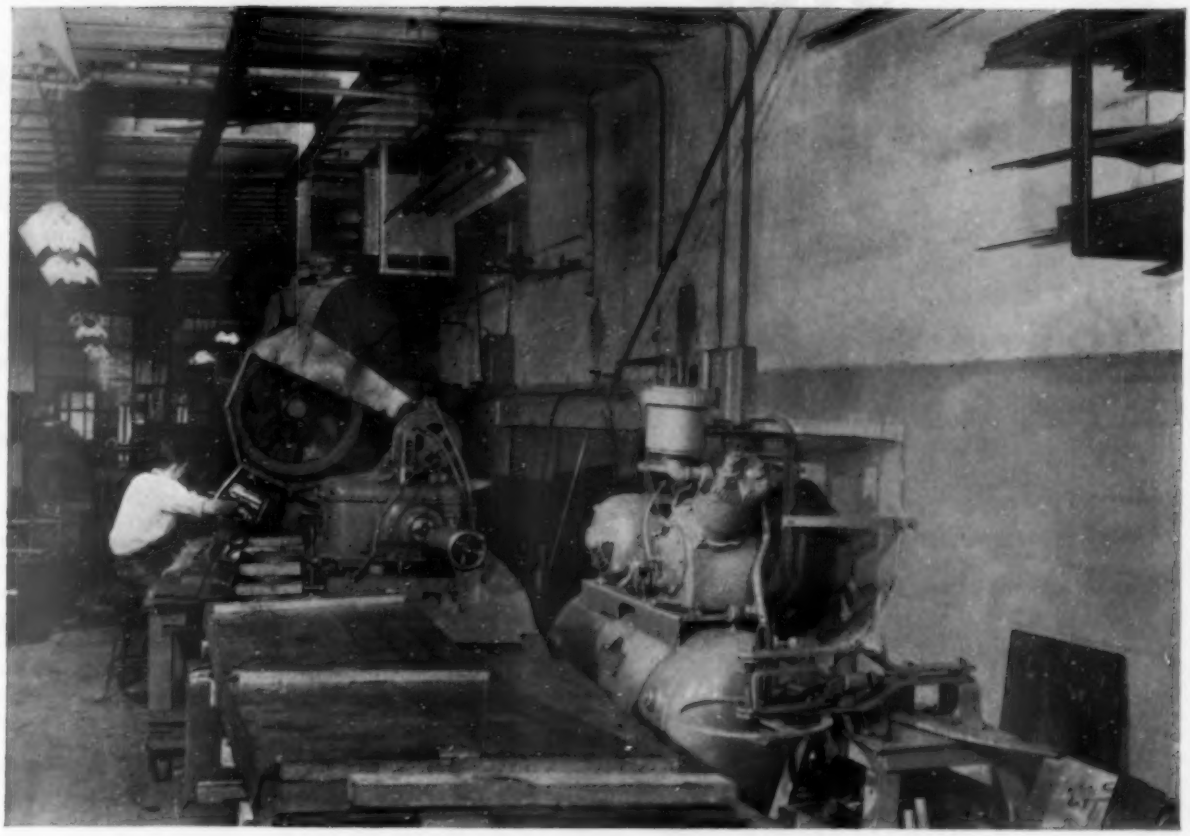
**51—Temperature Control Systems.** Bulletin F6149-2 features automatic controls for process applications. Tells how to select and use sensing element; how to select proper method of control. Outlines six systems, telling where to use. 8 pages. *Barber-Colman Co.*

**52—Valves.** Complete catalog covers line of electrically operated valves for gas, air, oil, water, steam, other fluids. Includes gas valves for boilers, new three- and four-way pneumatic valves for machinery, air pressure regulators, etc. *General Controls Co.*

## PACKAGING & SHIPPING

**53—Bulk Packaging.** Case histories of six different types of bulk packaging problems and how they were solved. Discusses benefits and economies resulting from use of multi-unit and king-sized containers. *Gaylord Container Corp.*

**54—Steel Strapping.** Heavy-duty flat steel strapping equipment and accessories are described and illus-



# *Punching Out Extra Profits*

**Dependable Westinghouse Air Compressor supplies versatile, economical air power to raise production and lower costs**

That's just what the operator of this punch press is doing — punching out the extra profits that result from increased production.

And it's a Westinghouse Air Compressor that's responsible for his greater output.

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Let compressed air help you punch out those extra profits with its versatility. And guarantee yourself a trouble-free source of supply by using Westinghouse Air Compressors. Sizes up to 40 hp — write for latest literature.

W-102

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# STOP VIBRATION

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- Install Equipment Anywhere (for better plant layout)
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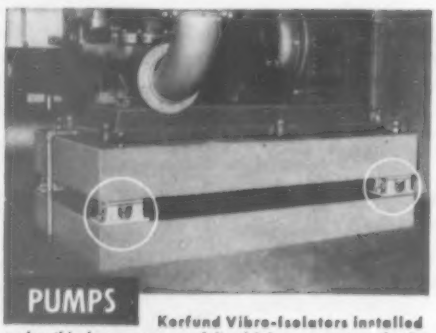
- Reduce Maintenance
- Improve Employee Efficiency

Whether your problem is simple or complex, Korfund engineers will gladly recommend the easiest, most economical, effective solution. A half-century of experience is at your disposal. There are standard stock Korfund isolators for the majority of installations — special designs when necessary.

A selector chart is available, giving recommendations for both normal and critical conditions, for pumps, compressors, centrifuges, machine tools, presses, hammers and most other processing and mechanical equipment. Write us for your copy of Bulletin No. 12, or see our catalog in Sweet's Files.

Korfund Vibro-Isolators installed under these shaker screens, located on a barge, stop vibration transmission into the deck without reducing the efficiency of the shaking action which removes shale cuttings from off-shore oil drilling mud. Another application—low cost upper floor screen installation without reinforcing.

Korfund Isolation permitted installation of five 250 H. P. duplex compressors in limited basement space actually overlapping building column footings—yet completely kept vibration from delicate bacteria cultures on upper floors of this pharmaceutical plant.




Korfund Vibro-Isolators installed under this large pump and its driving motor completely stop transmission of vibration and objectionable noise to floors below.

For specific recommendations without obligation, contact us or the Korfund representative you'll find in most principal cities.

THE KORFUND CO., INC.

48-35C Thirty Second Place, Long Island City 1, N. Y.
In Canada: 510 Canal Bank, Ville St. Pierre, Montreal


**FACTORY / CATALOG NEWS**
*Begins on page 134*

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trated in this 8-pager. Photos show application in carloading, truck-loading, palletizing, and unit reinforcement. *Gerrard Steel Strapping Div., U.S. Steel Corp.*

**55—Automatic Bagging Scale.** Bulletin 3749A describes a bagger that handles any product packageable in open-mouth paper or textile bags—weighs and fills them fast and accurately. Suggests feeding arrangements. Gives accessories. 6 pages. *Richardson Scale Co.*

**56—Waterproof Tapes.** Bulletin describes two types. Outlines uses in packaging jobs where you want to prevent damaging moisture from seeping in. Table of 20 product properties includes tensile strength, adhesion, resistance to solvents. *Kendall Co.*

## MISCELLANEOUS

**57—Work Positioners.** Bulletin R-1700-B15 outlines seven considerations in selecting for welding, coating, surfacing, shipping, various other jobs. Data on table rotation, tilt range, maintenance. 8 pages. *Worthington Corp.*

**58—Safety Signs.** Over 2000 metal signs and tags are illustrated in this 48-pager in actual colors available. Includes individual letters — porcelain embossed, reflective light and plastic. Signs for specific problems. *Ready Made Sign Co.*

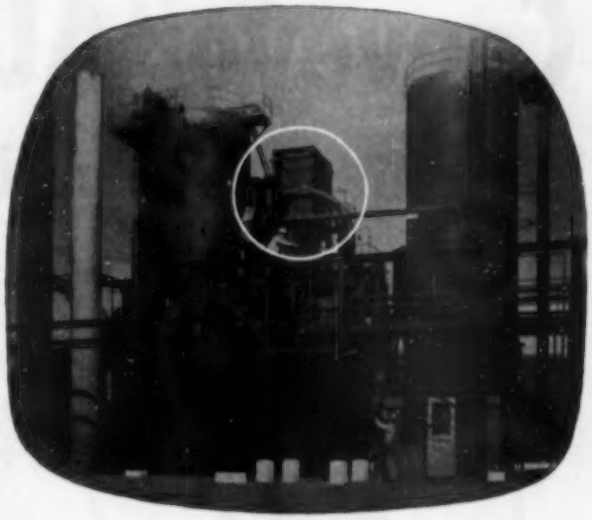
**59—Final Assembly Ordering.** Brochure presents a system that employs "Copyflex" reproducer. Outlines steps from preparation of bill of materials to use of final assembly production copies. 8 pages. *Charles Bruning Co.*

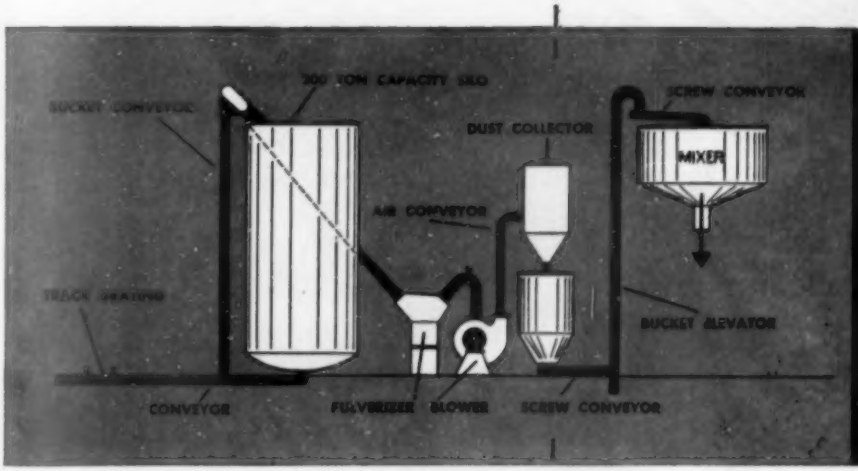
**60—Batteries.** High-power units for control, switchgear, emergency lighting, and auxiliary power are featured in Bulletin CP-538/55. Ratings and capacities. Dimensions, weights, types of containers. *C & D Batteries, Inc.*

***Efficiency of WHEELABRATOR® collector provides***

# dust-free handling of talc and coal

**For Koppers Co., Inc.**






*no product loss in this automatic materials handling system*

When Koppers Co., Inc., built their new Fontana, Cal. plant for producing tar-base, pipe-line coatings, a Wheelabrator Dustube cloth-tube type collector was selected on the basis of its high efficiency for controlling and recovering the dust created in the materials handling system.

The handling system, controlled by push buttons, conveys the dry materials . . . coal and talc . . . from railroad cars or trucks to a storage silo through the pulverizer, into the weigh hopper and then into the mixer. Dust in the process is reduced to a negligible amount through use of totally enclosed conveyors and a Wheelabrator Dustube Collector which traps all of the fine material and empties into the weigh hopper. As a result, volume production is achieved without product loss because all material is confined in the handling system.

The high efficiency product recovery of this installation is typical of the performance of the Wheelabrator Dustube Collector in thousands of plants. Each installation is individually engineered for the particular job. Wheelabrator engineers are ready at all times to develop the best filtration system for your problem. Write today for Catalog 372 for full details.

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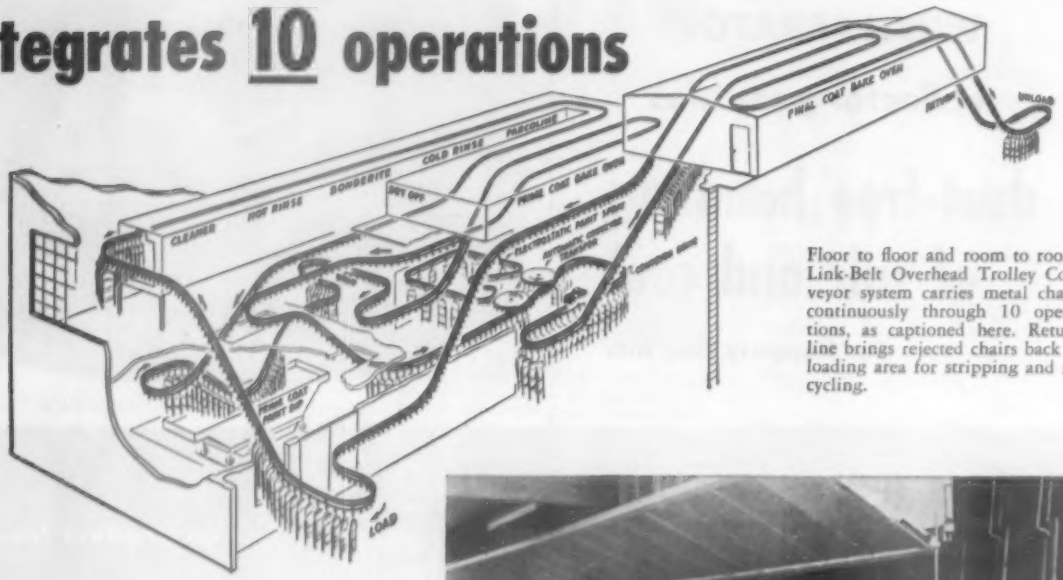
*for dust and fume control at peak efficiency*

**AMERICAN WHEELABRATOR & EQUIPMENT CORP., 374 S. Byrkit St., Mishawaka, Indiana**

# Conveyor AUTOMATION

## integrates 10 operations

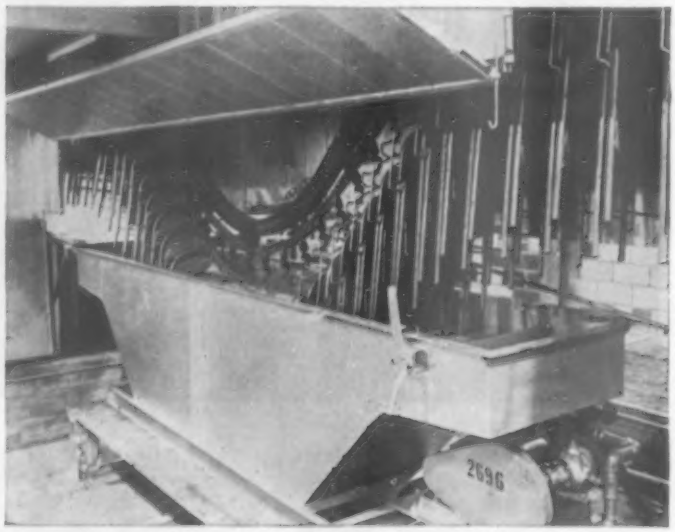



Floor to floor and room to room, Link-Belt Overhead Trolley Conveyor system carries metal chairs continuously through 10 operations, as captioned here. Return line brings rejected chairs back to loading area for stripping and recycling.

### LINK-BELT system provides continuous automatic handling at American Seating Company

American Seating Company of Grand Rapids, Mich., found their operations of cleaning and painting metal chairs lagging behind demand. Through the combined efforts of their own engineers, those of Newcomb-Detroit Co. and Link-Belt, this unique, automatically-controlled conveyor system was developed. Nearly 1000 ft. long, it has improved working conditions and coordinated processing . . . all in a minimum of space. And not only have production requirements been met — product quality is at an all-time high.

Next time you face a tough materials handling job, put Link-Belt specialized engineering experience to work for you. For full information and prompt, expert cooperation, call your nearest Link-Belt office. Send for Book No. 2330.



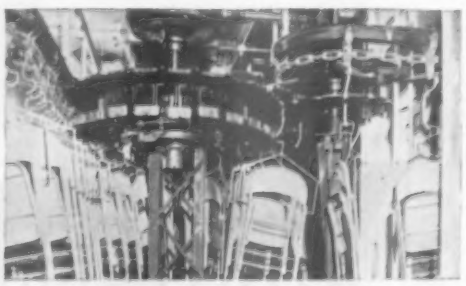

U-bend in conveyor's path lowers chairs into prime coat enamel. Painting operations — formerly messy, hazardous and tiring — are now performed automatically, with no danger to workers.

LINK-BELT

IN-THE-FLOOR AND OVERHEAD TRUKVEYORS
OVERHEAD TROLLEY CONVEYORS

13.064

Write for Book 2536 on the new Link-Belt Ball Bearing Trolley.



Conveyor at right emerges from spray booth — hooks with painted chairs are transferred back to main conveyor.

LINK-BELT COMPANY: Executive Offices, 307 N. Michigan Ave., Chicago 1. To Serve Industry There Are Link-Belt Plants and Sales Offices in All Principal Cities. Export Office, New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville, N.S.W.; South Africa, Springs. Representatives Throughout the World.

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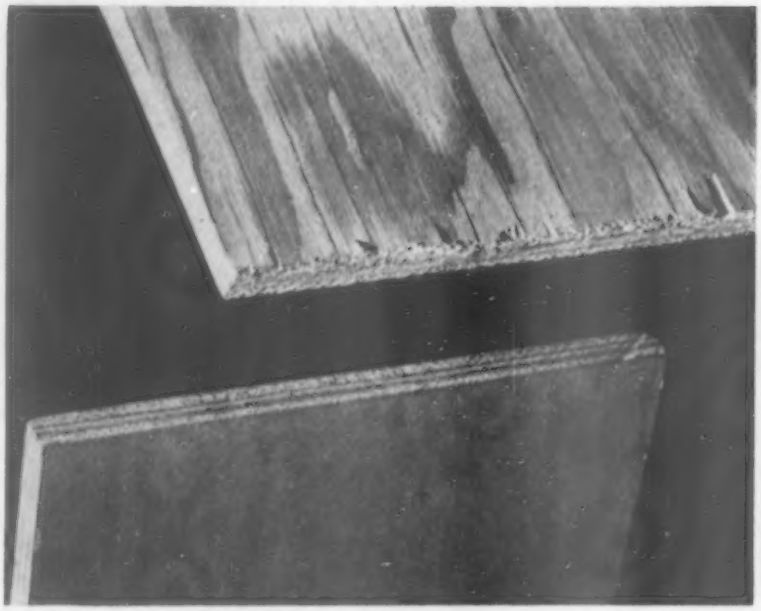


**WEATHERING TEST** shows difference between untreated plywood and Crezon-fused plywood. Latter shows no signs of cracks, checks, or grain raise.

# Fused-Plastic Surface for Plywood

**A smooth, paintable surface fused to plywood expands its usefulness as exterior building material.**

Crezon is made from wood fibers and tough phenolic resin. As an overlay for plywood, it is supplied to plywood mills in rolls. There it is bonded to plywood under intense heat and pressure. The Crezon surface and the plywood fuse chemically—become one and inseparable. With this protective coating, plywood takes on improved characteristics. It can be worked easily, yielding smooth edges without splitting or splintering. The resin holds the wood firm and tight for planing, jointing, shaping, grooving, or routing. The smooth surface resists all forms of weathering — including moisture, heat, cold, and fungus growth.

It can be easily painted, without priming. Only one coat is needed to cover, since wood grain does not show through. The above characteristics make Crezon-fused plywood desirable for interior work.

*Crown Zellerbach Corp.* (Circle 1, Reader Service Card.)

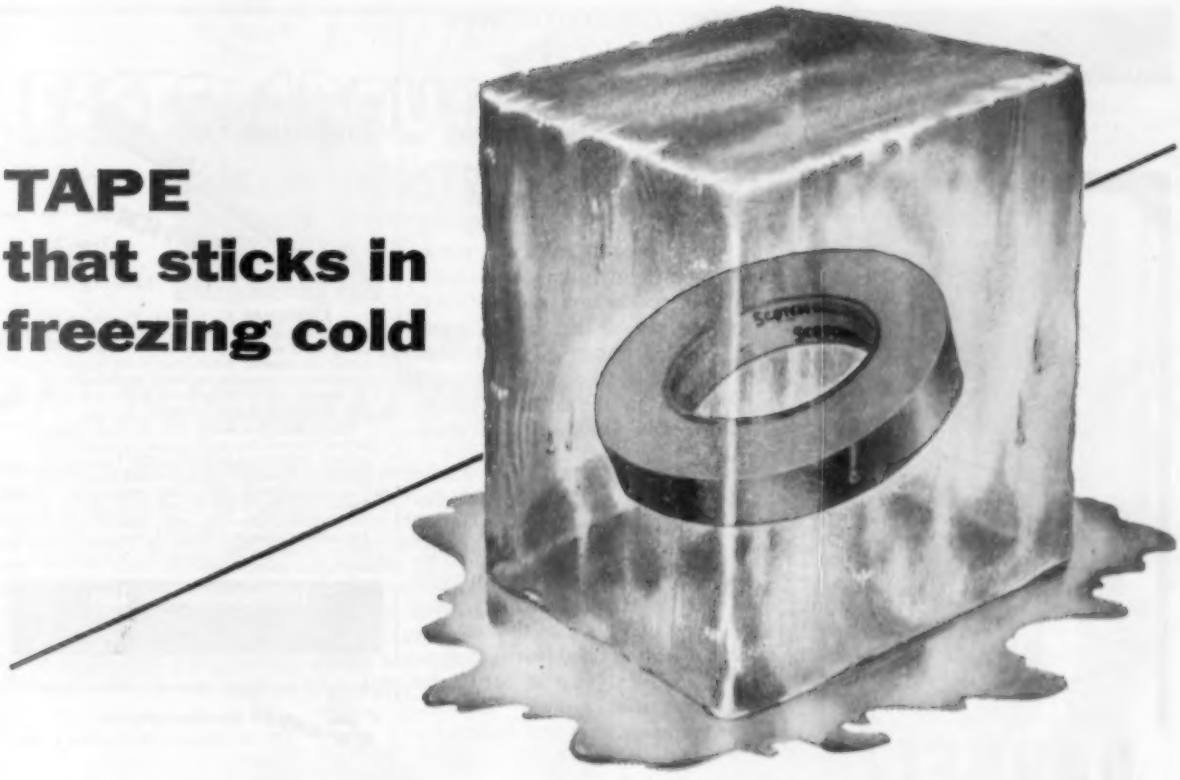
## Another Application for Synthetic Fibers

Nylabond is a highly resilient padding material of nylon fibers bonded with Bakelite phenolic resins. Withstands rugged use and resists deterioration. Has high tensile, shear, and impact strengths. Withstands heat or steam up to 350 F. for short times—or up to 250 F. for extended periods. Resists cold, mold, fungus, and bacterial growth.

*Gustin-Bacon Mfg. Co.* (Circle 2, Reader Service Card.)

*Turn the page*

# TAPE that sticks in freezing cold



Tough, moisture-resistant "SCOTCH" Brand Acetate Fibre Tape sticks at a touch to metal, plastic, wood, glass . . . even at below-freezing temperatures. Long-aging and dimensionally stable, too. Available in 12 eye-catching colors for coding or identifying; can be printed on if desired. Meets Government Specification JAN-P-127. Ask your regular distributor for "SCOTCH" Brand Acetate Fibre Tape, or write us for further information.

## ACETATE FIBRE TAPE

*. . . one of more than*

## 300 Pressure-Sensitive Tapes

*for industry, trademarked . . .*

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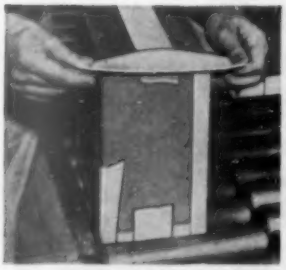
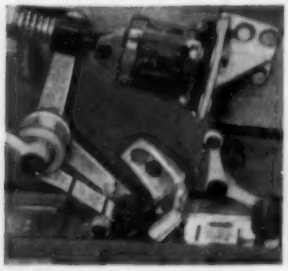
# SCOTCH

## Look what you can do with it!



**SEAL** cartons against moisture. "SCOTCH" Brand Acetate Fibre Tape holds securely; transmits less moisture than carton itself.

**HOLD** bags and packages closed at below-freezing temperatures. Even changes from cold to warm or hot won't unstick this tape.



**LABEL** products or containers at production-line speeds with *printed* "SCOTCH" Acetate Fibre Tape and automatic Applicator.

**FREE FOLDER** on money-saving advantages of "SCOTCH" Brand Acetate Fibre Tape. Write on your letterhead to Dept. CO-85.

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The term "SCOTCH" is a registered trademark of Minnesota Mining and Mfg. Co., St. Paul 6, Minn.
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## FACTORY / MATERIALS NEWS

*Begins on page 244*

For more about these materials, circle item numbers on Reader Service card next to back cover.

**3—Vinyl-Clad Sheet Metals** are abrasion-resistant and rustproof. Marvibond process makes it possible to apply vinyl films or patterns at a high production rate. Resulting sheets can be sheared, crimped, bent, drilled, and punched with standard tools, without separating the vinyl from the metal. *Naugatuck Chemical Division, U. S. Rubber Co.*

**4—Plymaster** V-2 is a glass-reinforced adhesive film for bonding metal to metal, plastic to metal, etc. Results in up to 40 psi. peel strength and over 2000 psi. in tensile shear strength. Glue lines as thin as 1½ mils can be obtained with application of pressure. Can be cut to size and shape with ordinary scissors. Curing requires heat and slight pressure; adhesive flow begins at 200 F. *Rubber & Asbestos Corp.*

**5—Concrete Glue** bonds new concrete to old "Pree-mix" is water-soluble in liquid state—yet dries crystal clear to permanent, waterproof, acid-resistant bond. Permits feather-edge patches. *General Materials Co.*

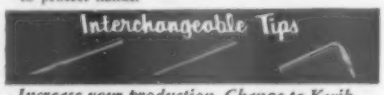
**6—Self-Vulcanizing Rubber** quickly repairs bruises, tears, and edge damage on conveyor belts. No heat. No heavy vulcanizing equipment. REMA is a repair material that vulcanizes by chemical action. Seals out moisture—reduces mildew, etc. *Flexible Steel Lacing Co.*

**7—Foil-Enclosed Insulation** has Fiberglas mineral wool inside—highly reflective aluminum foil outside. Outer side is perforated to avoid buildup of moisture. Produced in widths of 15, 19, and 23 inches—in lengths up to 60 feet. *Owens-Corning Fiberglas Corp.*

**8—Lamicor** is an industrial grade of reinforced glass fiber. Can be used in fixtures, templates, and jigs of all kinds. Shear strength is 8200 psi.; tensile strength, 27,700 psi. Lamicor is lightweight, forms into special shapes, is fire-resistant, cor-

**Because** Kwikheat Thermostatic soldering irons are especially designed for the close, tight soldering required for quality electronic equipment, production soars when old-style heavy irons are replaced by light weight (7½ oz.), perfectly balanced, small size Kwikheat Junior Type 200 irons.

Controlled by a sealed, built-in, high temperature thermostat that heats quickly, maintains preset heat (800° for production, 700° for stand-by) Kwikheat irons are economical and long lasting. Current used to maintain heat is only one-third heater capacity. Stainless steel core and tips resist corrosion. Three versatile, plunger type tips are easily changed in the field. Big, easy-to-grip plastic handle is air cooled, has a wide flange to protect hands.




*Increase your production. Change to Kwikheat Thermostatic soldering irons today.*

KWIKHEAT Manufacturing Co.
3732 San Fernando Rd., Glendale 4, Calif.

CUT FINISHING COSTS THROUGH INCREASED PRODUCTION

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A competent engineering staff will counsel with you on the most efficient technique for handling your particular requirements.

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Increase production hundreds to one over hand methods. Reduce labor costs. Eliminate need of experienced workmen.

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Positive pressure and exact registration of the part in the mask. Reduce rejects. Free both hands for productive movements.

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50% faster than any other make. Cut solvent consumption. Avert production delays due to damaging of masks by hand scrubbing.

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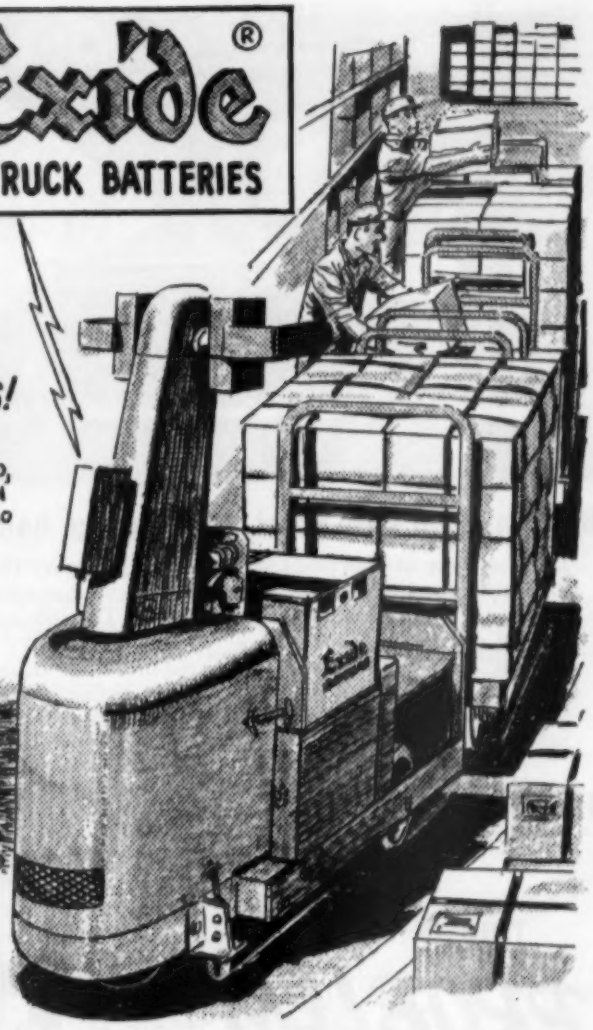
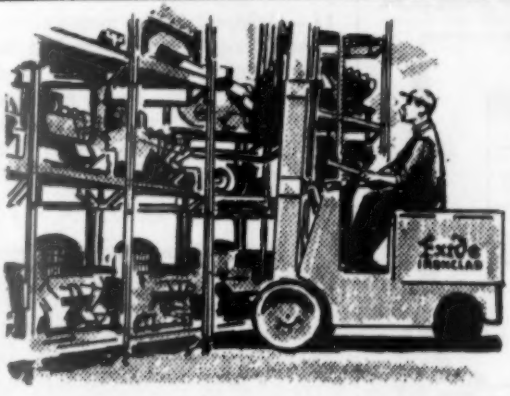
## IRONCLAD® INDUSTRIAL TRUCK BATTERIES



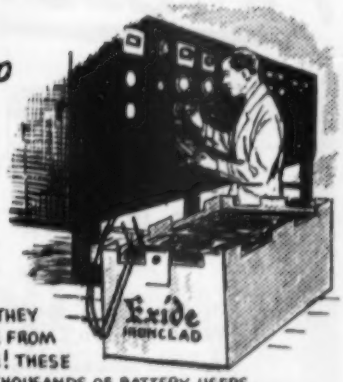

## MOVE MORE MATERIALS... CHEAPER WITH "AUTOMATED" TRACTORS!

NEW EXIDE-POWERED BARRETT TRACTORS, REMOTE CONTROLLED, MOVE MATERIALS THROUGH WAREHOUSES AND PRODUCTION AREAS AUTOMATICALLY... NO OPERATORS ARE NEEDED! RADIO WAVES BEAMED DOWN FROM AN OVERHEAD WIRE DO THE JOB. FOR THE AUTOMATED TRUCKS OF THE FUTURE, OR THE HIGHLY EFFICIENT ELECTRIC TRUCKS NOW IN USE, DEPENDABLE EXIDE-IRONCLADS FURNISH AMPLE POWER, DO IT FOR YEARS AT LOWEST PROVED COST FOR OPERATION, DEPRECIATION AND MAINTENANCE. EXIDES ARE ALWAYS YOUR BEST POWER BUY—*AT ANY PRICE!*




## END WORK-SCHEDULING WORRIES... *IRONCLADS STAY STRONG* TO SHIFT'S END!

POWERFUL IRONCLADS HELP YOU KEEP PRODUCTION MOVING WITH UNIFORM RATE OF MATERIALS HANDLING! THEY KEEP TRUCKS WORKING FULL-SHIFT, WITH NO LAST-HOUR LET-DOWN IN TRUCK POWER OR PERFORMANCE... YOU MAKE FULL USE OF EVERY MAN AND MACHINE, GET MORE WORK DONE!




## *WORKED TO DEATH TO LEARN SECRET OF LONGER LIFE...*

LAB TESTS OF IRONCLADS AGAINST CONVENTIONAL BATTERIES SHOW THAT THEY PERFORM BETTER... HAVE FROM 20% TO 30% LONGER LIFE! THESE FACTS, DEMONSTRATED BY THOUSANDS OF BATTERY USERS, EXPLAIN WHY EXIDE-IRONCLADS ARE YOUR BEST INDUSTRIAL TRUCK BATTERY BUY— *AT ANY PRICE!*

LET EXIDE HELP SOLVE YOUR INDUSTRIAL TRUCK BATTERY PROBLEMS. ❶ CALL AN EXIDE SALES ENGINEER FOR FULL DETAILS. ❷ WRITE FOR FORM 1982, A MANUAL ON INSTALLING AND MAINTAINING MOTIVE POWER BATTERIES.

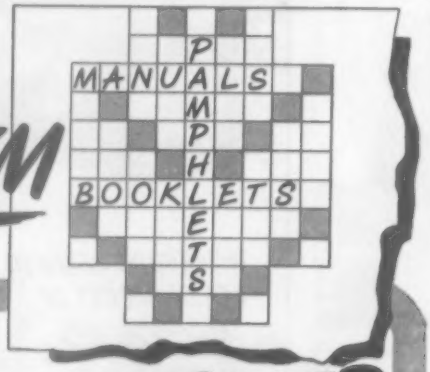
**Exide INDUSTRIAL DIVISION,** The Electric Storage Battery Company, Philadelphia 2, Pa.

**Bearcat Electric Hoist cuts scrap handling time**

Loading scrap at this plant was formerly done by hand. It took two men the better part of a day to load one truck. Now, with a Bearcat Electric Hoist and tilt-bins, the same job is done in about 20 minutes. The plant cuts handling costs, gets better scrap disposal service. The dealer saves time. Investigate Bearcat Electric Hoists. They lift light to medium loads—170 to 4000 pounds—and require little maintenance. Ask your authorized industrial distributor for Bulletin P-53. Or write us.

**THE HARRINGTON CO.** *Makers of Hoists since 1876*
Gravers Road at the Turnpike, Plymouth Meeting 21, Pa.

IF
THIS IS YOUR
PROBLEM

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rosion-free, easily cleaned. In sizes up to 51x105 in. and in thicknesses up to 1½ in. *Strick Plastics Corp.*

**9—Teflon Felts** that withstand temperatures up to 400 F. are so chemical-resistant that they can be boiled in aqua regia or fuming sulfuric acid. Useful for solving filtering problems where both heat and corrosive chemicals are involved. Available in 1/16 to ½ in. thicknesses and 20 in. by 4 yd., maximum size. *Fabrics Division, Du Pont Co.*

**10—Concrete Sealer** prevents "dusting" of floors—adds permanent non-fading color. Kwik-Color Seal comes in tile red and light gray; dries hard to the touch in 20 minutes; develops excellent water resistance in 14 to 20 days. Covers approximately 800 sq. ft. per gallon. *Multi-Clean Products, Inc.*

**11—Destimetal** is a metal alloy in plastic form. Can be applied as a filler to other metals, wood, plastic, glass fiber, plaster. Easily machined, filed, or sanded—and generally worked as any other metal alloy. Repairs castings, stampings, molds, etc. *Destiny Products Co.*

**12—High Temperature Cermet** coats metal surfaces to resist oxidation and erosion often resulting from extreme heat. Composed of nickel and magnesium oxide. Can be brushed on, or flame-spray-coated to thicknesses of up to 30 thousandths. *Metal Hydrides, Inc.*

**13—Celastic and BBX** combine to form a thick layer of protective plastic on metals, wood, etc. Celastic has small plastic particles pressed into woven cotton fabric. It's immersed in BBX for a few seconds, then applied. *Calahan & Horsey, Inc.*

**14—Plastic Armorplate** cannot be penetrated by 0.22 cal. bullets. It's lightweight, can be molded into intricate shapes, is non-magnetic, and comes in various colors. *Bassons Industries Corp.*

**AIRengineering at work**
**REPORT No. 4240.70**

# *Air Motor Takes "Backache" Out of Molding Job...*

# SAVES $3.10 *a day..*

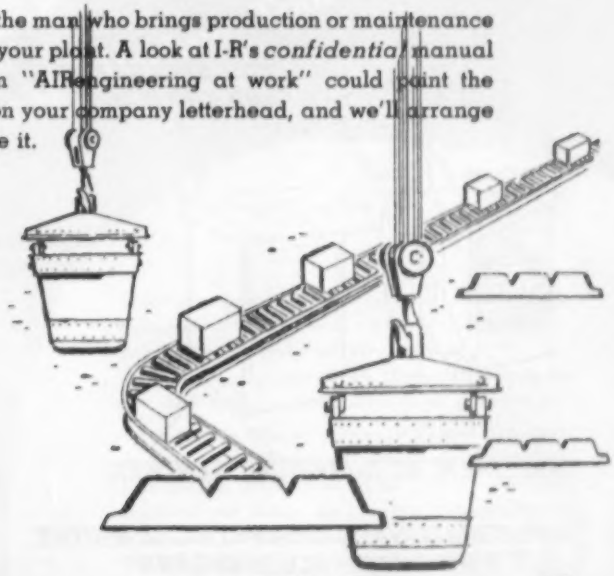
A large producer of aluminum parts had a number of strenuous jobs. One involved manually moving a four foot rack and pinion handle through a 200° arc to raise and lower a collapsible core in a book mold.

AIRengineering was put to work. An Ingersoll-Rand Size 55SO Air Motor was installed to operate the pinion. Production jumped from 180 to 220 pieces per day . . . workers no longer complained . . . and savings amounted to $3.10 a day. As a result, two more Air Motors were installed, with similar savings.

You may be the man who brings production or maintenance savings into your plant. A look at I-R's *confidential* manual of reports on "AIRengineering at work" could point the way. Write on your company letterhead, and we'll arrange for you to see it.

Air Motor raises and lowers collapsible core. Here the mold is open showing the core in "up" position.

8-271



**Ingersoll-Rand**

11 Broadway, New York 4, N.Y.

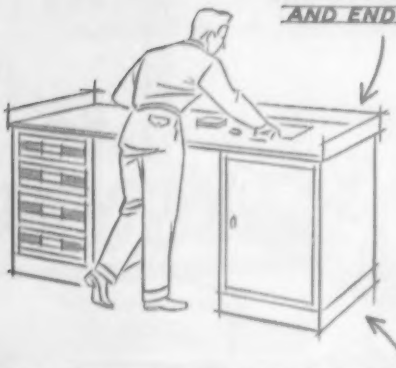
**AIRengineering Manual**

Don't miss over 100 interesting case history applications of AIRengineering in this confidential manual

# HOW TO USE STANDARD HALLOWELL UNIT WORK BENCHES AND ACCESSORIES IN PLANT MODERNIZATION

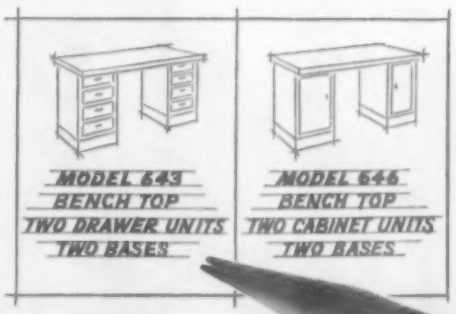
**MODEL 640** - BENCH TOP, DRAWER UNIT, CABINET UNIT, TWO BASES

ASSEMBLE THEM IN CONTINUOUS LINE - JOINED IN THE MIDDLE OF THE UNITS OR BUTTED END-TO-END




USE THEM AS INDIVIDUAL BENCHES

4 TOP MATERIALS, 2 LENGTHS, 2 WIDTHS 2 HEIGHTS - ALL STANDARD



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HALLOWELL SHOP EQUIPMENT DIVISION

SPS

JENKINTOWN PENNSYLVANIA

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in a complete range of sizes

ENGINE LATHES
in a complete range of sizes

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for high production metal turning

THE HYDRA-SLIDE
for high production chucking and fixture work

THE SPEEDI-MATIC
a fast, precision hand screw machine

MONARCH-KELLER TURNING MACHINE

THE MONARCH MOTOR-TRACE

THE MONARCH AIR-GAGE TRACER

THE MONARCH ROLL TURNING LATHES

THE MONARCH 60" RIGHT ANGLE LATHE

THE SHAPEMASTER ENGRAVER

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# FACTORY | NEW FILMS

**You Are There at the Bargaining Table** shows an actual union-management contract bargaining session in action, with about 30 union and company representatives discussing wage rates, fringe benefits, and an incentive pay plan. The film also takes you through the company plant concerned and shows employees at work. Accompanied by 125-page kit (for training purposes) with suggestions for staging a film conference, background material on collective bargaining, and special articles and exhibits. 16 mm, sound, black and white, 50 min. Available for rent or purchase from:

*American Management Assn., 330 West 42nd St., New York 36.*

**Malleable Metals** depicts the newest equipment and methods used for high production of small castings. Takes you through the plant to show cores being made and set in place, molds made and poured, and castings cleaned and finished. Describes the complete operation of mold blowing machines and other modern mechanized equipment. 16mm, sound, color, 13 min. For loan, write:

*Albion Malleable Iron Co., Albion, Mich.*

**The Story of the NLRB** explains how managements and unions can use the services of the National Labor Relations Board to improve labor-management relations. Outlines the functions of the Board, gives examples of unfair labor practices examined by the Board for legality for both industry and union; shows their presentation before regional offices, and analyzes legal aspects of issues. 16mm, 23 min.

*Institute of Management and Labor Relations, Rutgers University, New Brunswick, N. J.*

**Flaw Location With Dye Penetrants** demonstrates every aspect of dye penetrant inspections from laboratory theory to actual on-the-spot production-line techniques in various plants. Describes in detail the theory behind dye penetrants and outlines the proper methods of obtaining complete inspection accuracy. Viewer can see exactly what action takes place in location of flaws. 16 mm, sound, color, 23 min. For loan, write:

*Turco Products, Inc., 6135 South South Central Ave., Los Angeles 1.*

**Compressed Air Power** uses animation to explain the compression principles of different types of compressors, and the operating principles involved in applying all compressed power. Takes the viewer through entire compression cycle for a simple compressor. Covers both displacement and dynamic compressors: 16 mm, sound, color, 17 min. For purchase ($60), write:

*Compressed Air and Gas Institute, Educational Committee, 1410 Terminal Tower, Cleveland 13.*

**The Spray's the Thing** is an animated film depicting the development of aerosol products, the way they operate, and both existing and potential uses. Shows many of the more than 80 types of products now available in aerosol containers. Color, sound, 13½ min. For loan, write:

*Du Pont Co., 6529 Nemours Bldg., Wilmington, Del.*

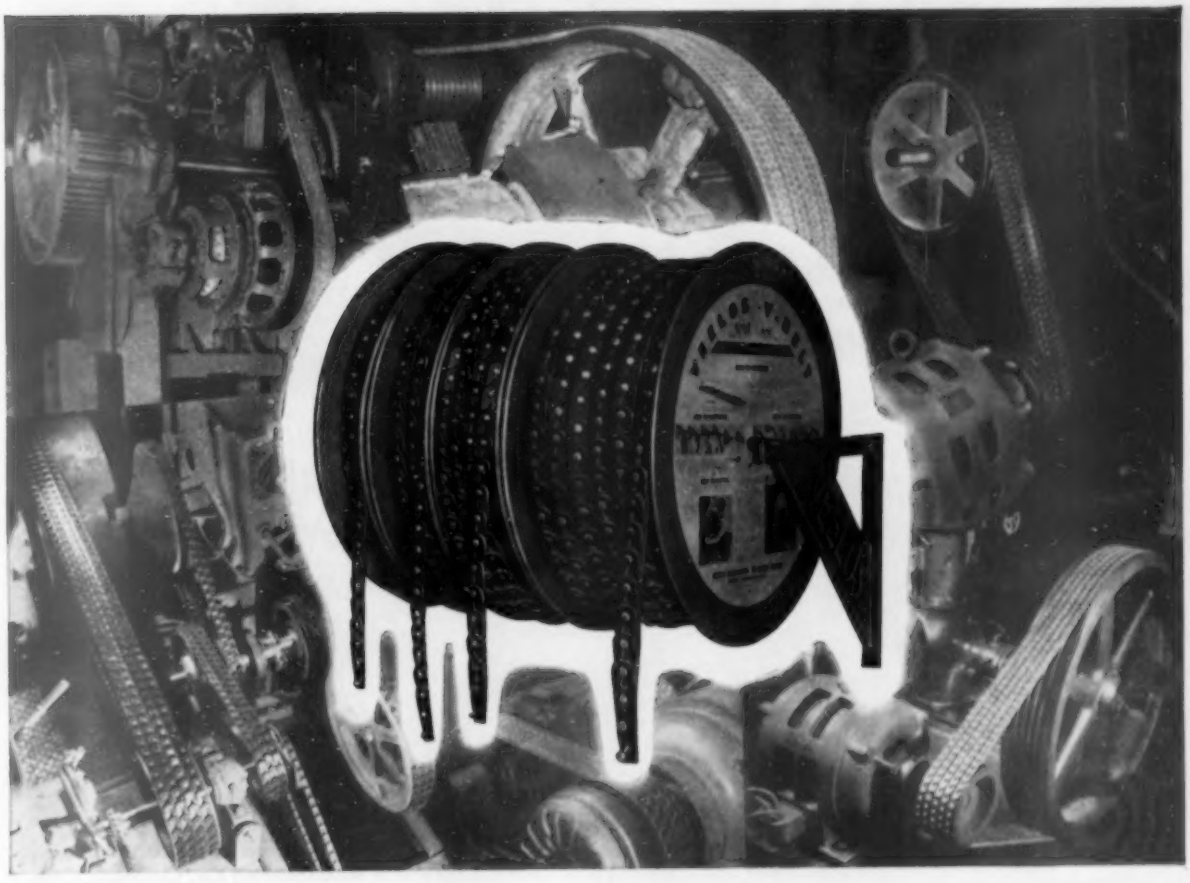
**They Need to Know** is designed to educate workers and public in the benefits of the Social Security law. Through dramatization, film outlines in detail every angle of social security that both provider and dependent should know. 16mm, sound, black and white, 13-16 min. For purchase ($23.95), write:

*United World Films, Inc., 1445 Park Ave., New York 29.*

**Horizons of Hope** documents the progress made in cancer cure, and outlines the scientific steps planned in the drive to eliminate the disease. Uses both live action and animation to present whole cancer control story and its problems. 16 mm, color, sound, 18 min. For loan or purchase, write:

*Movies U.S.A. Inc., 729 Seventh Ave., New York 19.*

*Turn the page*



# THIS *one* V-BELT INVENTORY
## *keeps your drives on the go*

Take a look at the illustration above—there's a *complete* v-belt inventory. Those four 100-foot reels of Veelos—the adjustable v-belt—in the O, A, B and C widths can replace up to 316 different sizes of endless v-belt. Of course, when you use only one or two widths of v-belt, you stock reels of only those widths. This 4-reel Veelos v-belt inventory is easy to maintain, stores in a space only 16 inches square, and is ready when you want it.

But inventory saving is just a part of the Veelos story.

Veelos adjustable v-belt is *easier to install*—in many cases installation is completed in 50% to 90% less time.

Using Veelos means you don't have to re-set motors or remove outboard bearings. Veelos v-belts provide *vibrationless, full power delivery.* A demonstration on an electronic vibration analyzer will show you and prove to you that Veelos v-belts *reduce vibration up to 90%!*

Switch to Veelos adjustable v-belt—the one v-belt that keeps your drives on the go. See your Veelos distributor. Write for your copy of the facts-packed Veelos Data Book.

VEELOS
THE BALANCED
LINK V-BELT

**MANHEIM MANUFACTURING & BELTING COMPANY**
**604 Manbel Street, Manheim, Penna.**

**ADJUSTABLE TO ANY LENGTH • ADAPTABLE TO ANY DRIVE**

Veelos is packaged on reels in 100-foot lengths. Sales engineers in principal cities; over 350 distributors throughout the country. VEELOS is known as VEELINK outside the United States.

Day-Brite CFI (Comfort For Industry) lighting provides comfortable lighting levels on all work surfaces by taking full advantage of wall and ceiling reflectances. Electric Controller & Manufacturing Co., Cleveland, Ohio.

# *Better seeing, better production with new Day-Brite* **CFI** *lighting*

**When you put "comfort" lighting to work for you, benefits are immediate and continuous—particularly if you install new Day-Brite CFI (*Comfort For Industry*) lighting.**

**By washing out brightness contrasts *at the ceiling*—as illustrated in the Day-Brite CFI-10 installation above—worker eye comfort is greatly improved. Nervous and muscular tensions and fatigue are reduced; morale and efficiency are boosted. Speedier and more accurate control of many work operations results; over-all higher standards of production are achieved.**

**There are two Day-Brite CFI units available—the CFI-10 and CFI-25. They provide 10% and 25% upward lighting, respectively. Updraft ventilation promotes cool operation and minimizes dust deposits on fixture bodies.**

**SEE, EXAMINE and COMPARE Day-Brite with any other lighting. Look at the fixtures—not just the pictures!**

**CALL YOUR DAY-BRITE REPRESENTATIVE! You'll find his industry-lighting experience valuable.**

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*Day-Brite Lighting, Inc.*
*5441 Bulwer Ave.*
*St. Louis 7, Missouri*

**NATION'S LARGEST MANUFACTURER OF COMMERCIAL AND INDUSTRIAL LIGHTING EQUIPMENT**

*Begins on page 254*

## AIR POLLUTION

*The following films are listed as a supplement to the article, "Now it's Clean Air—or Else," on p. 97.*

**Air, Water, and Industry** covers both air and water pollution, and the need for better industrial waste disposal methods. Shows what typical industries are doing to abate pollution and gives a case study of one company's efforts and accomplishments. 16mm, sound, color, 22 min. For loan, write:

*The Dow Chemical Co., Midland, Mich.*

**City That Disappears** illustrates through live action and animation the causes and sources of smog. Tells the various steps taken by the city of Los Angeles and the Stanford Research Institute to combat and solve the problem. Describes researches on control and evaluation of efforts. 16mm, sound, color, 28 min. For loan write:

*Stanford Research Institute, 621 S. Hope St., Los Angeles 17.*

**The Air We Breathe** demonstrates the use of respirators in controlling air pollution in a plant. Shows physical effects of inhalation of dusts, mists, fumes, and gases. 16mm, sound, 26 min. Available for free loan of purchase ($40) from:

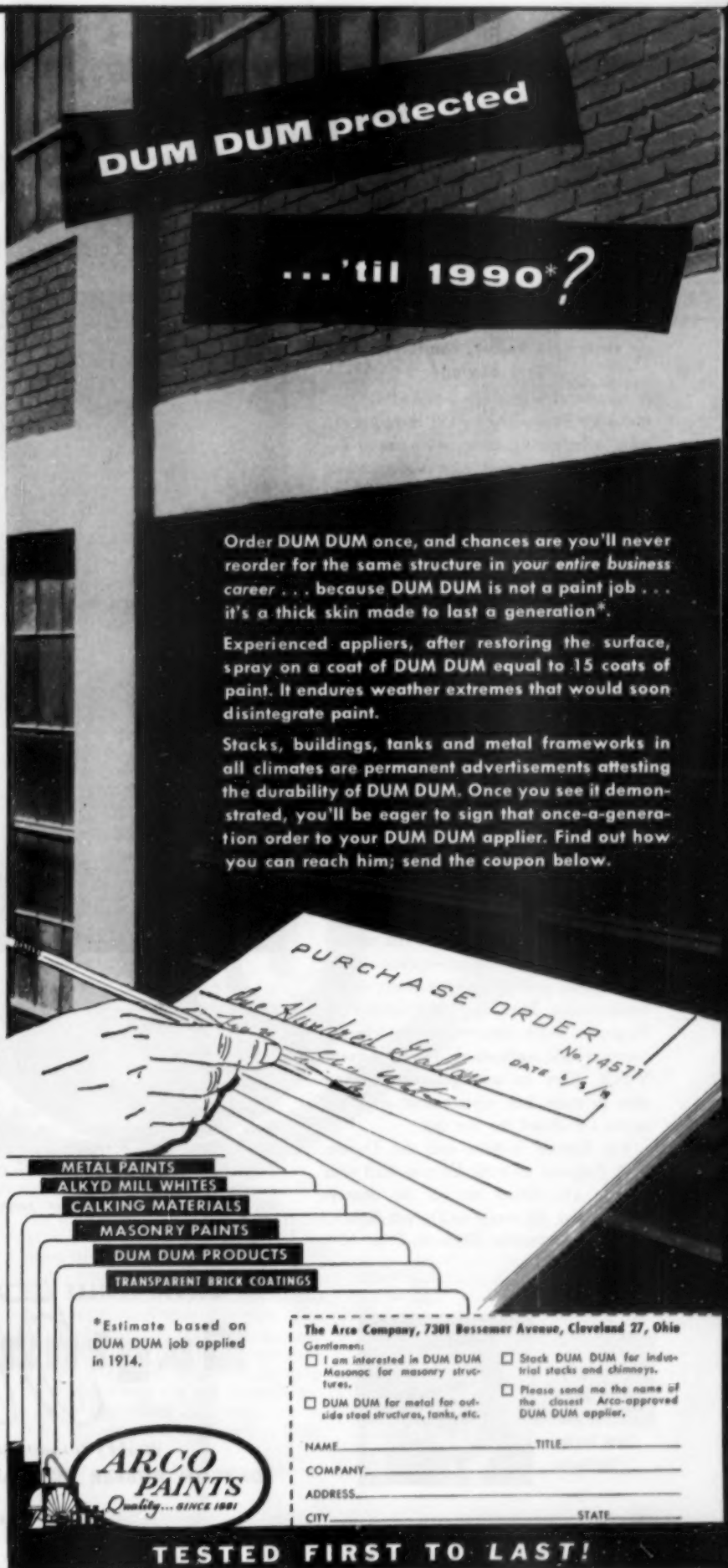
*Mine Safety Appliances Co., Braddock, Thomas & Meade Sts., Pittsburgh 8.*

**Stop Silicosis** describes how dust undermines health in various occupations, such as stone cutting, foundry work, painting, blasting. Outlines remedial measures taken. 16mm, sound, 10 min. For rent ($1.75) from:

*Indiana University, Audio-Visual Center, Bloomintgon, Ind.*

**Save a Day** shows state industrial engineers taking dust counts in a factory; changing a miner's drill to prevent silicosis; and low-pressure experiments by the Public Health Service. 16 mm, sound, black and white, 10 min. For loan, write:

*U. S. Public Health Service, Washington 25, D. C.*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# Dayton PM* Pays $$$$ Bonus

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*Preventive Maintenance Program

**Dayton V-Belt equipped air conditioning units keep thousands of customers happy, comfortable and *buying!***

A successful record of outstanding performance in cutting power transmission costs, eliminating downtime, improving plant operations and increasing production has endeared Dayton V-Belts to thousands of industrial firms. So, it is easy to see why Dayton V-Belts, backed by the planned Dayton Preventive Maintenance Program, were employed to drive the air conditioning units at the world's largest multiple-store shopping center.

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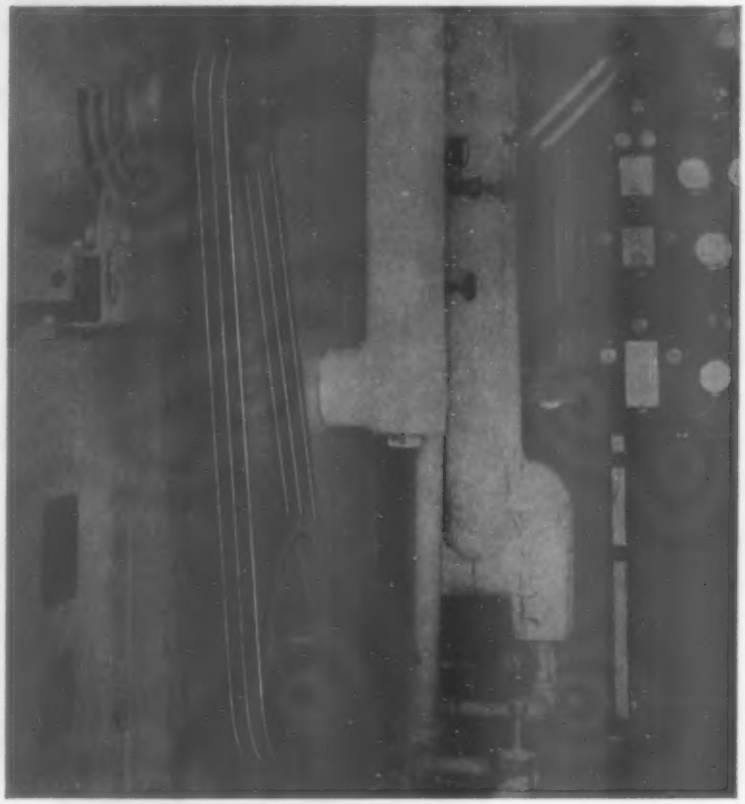
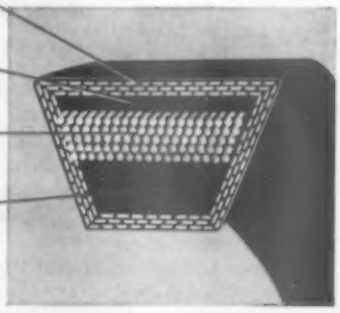
**Dayton V-Belts backed by P.M. Program**

Dayton V-Belts, designed and constructed with maximum strength and greater flexibility, give twice the service life of ordinary V-Belts — even under the rugged, stop-and-go operation of air conditioning. Then, too, the Dayton P.M. Program, which determines the life expectancy and replacement factor of every V-Belt drive in use, guarantees being able to make belt replacement *after* the stores are closed for the day.

Put Dayton V-Belts and the Dayton P.M. Program to work for you. Call your Dayton Distributor for all the money-saving facts. Or write to Dayton Rubber Company, Industrial Division, Dept. 656, Dayton 1, Ohio.





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**Exclusive Dayton 327-V Blend,** natural and synthetic rubbers, for easy stretch with instant recovery in tension section.

**Thoro-Bonded Rayon Cords,** with each filament actually rubber-coated, for greatest tensile strength and flexibility.

**Exclusive Dayton 812-V Compound in Compression Section,** for perfect crosswise rigidity, greatest flexibility, greater strength, longer life.

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See "Belting" in yellow pages for your local Dayton Distributor

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Dayton Rubber

50 YEARS OF PROGRESS

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# This Case of "Unprovoked Assault" Cost

*$2,010 in compensation alone — that's what it cost a southern machinery manufacturer when a turret lathe operator was struck in the left eye by a flying chip. A surgeon had to remove the eye. Apart from the humanitarian aspects, the pity of it all is that an AO† metal side shield spectacle goggle, for instance, costing at an average of about $2.30 would have prevented this accident. Even if this company had protected the eyes of the entire department (Cost: under $150) they would now be ahead by more than $1,860!

AO trademarked safety lenses are heat treated and individually tested to prevent accidents like this. The AO trademark on frames is another guarantee of quality eye protection. Ask an AO Safety Representative to show you where the eye hazards are in your operations . . . what can be done to meet them . . . and how little quality protection costs. (It can pay for itself within 6 months time.) Or write American Optical Company, 538 Vision Park, Southbridge, Mass., for booklet.

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# FACTORY | NEW BOOKS

**Heating, Ventilating, Air Conditioning Guide 1955**—This is the 33rd edition of this standard reference. 1160-page technical section has 53 chapters, grouped under seven headings: Fundamentals, Human Reactions, Heating and Cooling Loads, Combustion and Consumption of Fuels, Systems and Equipment, Special Systems, and Instruments and Codes. Revisions include several chapters rewritten as a result of recent research, changes in codes and standards, new product design, improved engineering practice. The equipment section includes technical data on the product of 328 manufacturers. *The American Society of Heating and Air Conditioning Engineers, 62 Worth St., New York 13. 1680 pages. $12.*

**Framework for Atomic Industry**—Subtitled "A Commentary on the Atomic Energy Act of 1954," this book examines the steps taken by Congress to provide the legal means for the industrial development of the peaceful use of atomic energy. The government control which affects the business and legal community involved in the growth of an atomic industry is explained. Discussed in detail is the system of licensing, the control of information, security clearances, patent and power policies, the provision for government assistance, and the mechanism of foreign trade in atomic facilities and materials. Appendices containing the Atomic Energy Act of 1954, the McMahon Act of 1946, the Report of the Joint Congressional Committee on the Act of 1954 make this book a useful reference to any plant men involved, or planning to become involved in any way with atomic energy. *By Herbert S. Marks and George F. Trowbridge. BNA Inc., a division of The Bureau of National Affairs, Inc., Washington 7, D.C. 228 pages. $12.50.*

**Front Line Cost Administration**—If you agree with the author's premise that foremen and supervisors are the "front line administrators" of all management policies which control manufacturing cost, you'll be interested in seeing this book to consider making it available to supervisors. The book is designed to show the supervisor exactly how to administer his shop costs, to equip him with enough practical industrial engineering knowledge to function more effectively. Covers the cost aspects of methods changes, production standards, incentives, materials, job evaluation, many other subjects in the industrial engineering realm. *By W. C. Cooling. Chilton Co., 56th and Chestnut Sts., Philadelphia. 259 pages. $5.*

**Manual of Lathe Operation**—This is a recent revision of this reference source of lathe operation. Its pages illustrate and describe in easy-to-understand language the care and operation of modern screw-cutting lathes. And latest technical data for machining new alloys and plastics is included. Book is easy to use—divisional tabs make any chapter easy to find, and special binding allows the book to lie open flat at any page. Includes chapters on metal cutting, cutting tools, machining of various materials, holding the work, many others. *Atlas Press Co., 2384 N. Pitcher St., Kalamazoo, Mich. 253 pages. $1.50.*

**New Horizons in Color**—This new book does not confine itself entirely to the use of color in industry, and goes into more theory than the average plant man will need. But in spite of this it should prove interesting and valuable to those faced with the problem of selecting colors for a new or modernized plant and its equipment. It gives a clear outline of the physical, esthetic, psychological, and functional aspects of color. It includes workable suggestions and specifications based on the author's extensive and well-known experience, research studies, and case histories. All known systems of color and color harmony are examined. Many photographs. *By Faber Birren. Reinhold Publishing Corp., 430 Park Ave., New York 22. 200 pages. $10.*

*Turn the page*

# I Nearly Blew My Top!

"The other day the Detrex man pointed out to me that metal cleaning and surface preparation accounts for ¼ to ⅓ of all the operations in the average metal-working plant. It sure caught me by surprise and, frankly, it started me thinking about our own plant. After a complete survey we found over ¼ of all our operations were of that type.

"What was immediately apparent to me was how important even the smallest single savings would become when multiplied by the number of operations involved. It certainly changed my way of thinking on the importance of metal cleaning and surface preparation. When I think of how little regard we had been giving those operations, *I nearly blew my top.*

"Take, for example, our metal parts washing operations. By switching to Detrex cleaners we were able to effect savings of a size we never before thought possible. One of the things that really impressed us about Detrex Emulsions was the fact that they not only do an excellent job of cleaning but they also retard rust . . . and all in one operation. That alone saved us considerable money.

"Why don't you let the Detrex man in your area make the same type of survey in your plant? It isn't going to cost you a penny if he doesn't show you how you can save money. If he does, you'll probably buy some chemicals and/or equipment, but more important you'll be saving big dollars. You have nothing to lose and everything to gain. Why not give him a crack at it next time he calls?"

**Detrex alkaline and emulsion cleaners have reduced manufacturing costs in hundreds of plants. They provide better and more positive cleaning action... faster and at lower cost.*

*Service with a Saving!*

DETREX CORP.

Dept. 417 • Box 501, Detroit 32, Mich.

DEGREASERS • DEGREASING SOLVENTS • WASHERS
ALKALI & EMULSION CLEANERS • DRYCLEANING
EQUIPMENT • PHOSPHATE COATING PROCESSES

IN TRUCKS, it's the type of *performance* you need that decides your ultimate choice. In packaging too, the needs of your particular operation should decide the closure you use. Hudson has an improvement to give you more speed, more efficiency, more protection, and more economy too! Select the product you want to free test and let us send you a sample:

**FASTWELD** for speed in two-strip* production line sealing—for overall center seam protection that beats stapling, stitching or gluing. The fastest closure possible, and the biggest labor-saver. Reinforced in both directions with Fiberglas®, *Fast*weld comes to you with an extra heavy coat of Hudson's exclusive adhesive—Supple-ized© for easier handling.

*Authorized by amended U.F.C. Rule 41

**BLUE RIBBON** for speed in complete closure. The quality tape with incredible speed of adhesion. Just one fast sweep of the hands and you get a tighter, more permanent seal against dust, smoke, moisture, vermin. The secret—Hudson's exclusive adhesive, Supple-ized to give you instant full-depth moistening . . . quicker, better sealing.

**ORANGE CORE** for economical standard sealing. Every inch on every roll sticks with the same bulldog grip because Hudson controls all its ingredients. Hundreds of thousands of users depend on Orange Core's consistently superior quality and have made it the world's largest selling gummed sealing tape.

Quality Products by

**Hudson**

PULP & PAPER CORP.

477 Madison Ave., New York 22, N. Y.

P.S. On your letterhead—write Dept. FM-8 and tell us which product you want to free-test . . . Fastweld, Blue Ribbon, or Orange Core!



*Begins on page 258*

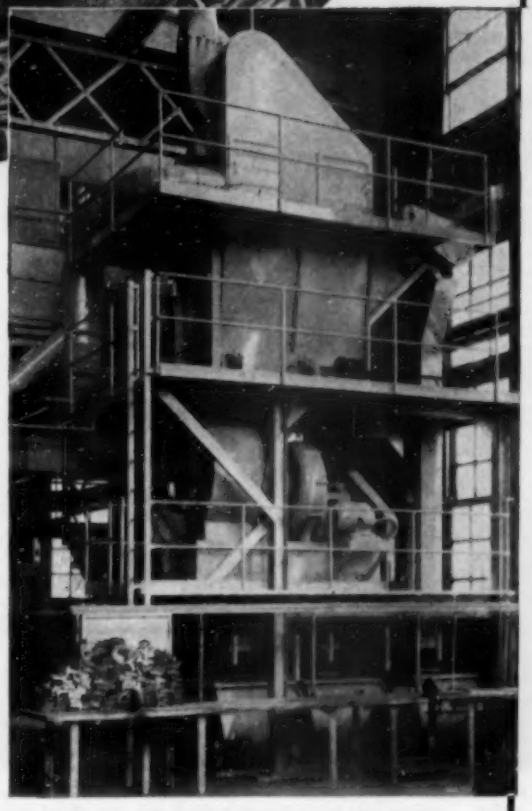
**Transactions of the 19th Annual Meeting of the Industrial Hygiene Foundation**—These contain a number of papers of interest to plant operating men. Sample titles: total rehabilitation, medical evaluation of noise, re-evaluating the physical examination in industry. *Industrial Hygiene Foundation of America, Inc., Mellon Institute, 4400 Fifth Ave., Pittsburgh 13. 241 pages. $5.*

## BOOKLETS

**Guide for Industrial Audiometric Technicians** — Recent court decisions holding loss of hearing due to industrial noise to be compensable have put new importance on hearing testing. This new manual is intended to furnish training and reference material for those who are learning to operate audiometers in order to conduct pre-employment hearing measurements. Particular emphasis is placed on the techniques required to secure accurate data and the proper method of recording findings. It is based on information gathered by the insurance firm in more than a year's experience in setting up this kind of program at both the industrial and community levels. *Accident Prevention Department, Employers Mutuals of Wausau, Wisc. Free.*

**Production Control Through Electronic Data Processing: A Case Study**—You need have no previous knowledge of electronic computers to understand this report. On the contrary, it's designed to describe and illustrate to the management reader the types of clerical operations these machines can be expected to perform. The report considers some of the major principles involved in applying these new machines to business operations. Then, to illustrate, it describes an in-plant research study, made at a medium-size manufacturing plant, and the electronic data processing system which was prepared to meet the production control requirements of the plant. Includes data on estimated costs and savings. *By R. G. Canning. Office of Technical Services, U. S. Dept. of Commerce, Washington 25. 52 pages. $1.50.*

# BETTER AIR IS OUR BUSINESS!

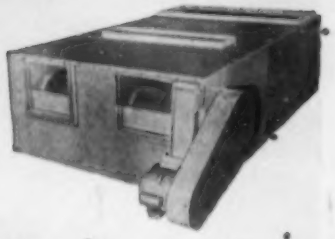


**Two complete ROTO-CLONE systems occupy only 66 SQ. FT. of FLOOR SPACE**

LACK of room is no alibi for not providing efficient dust control. Here's a dual ROTO-CLONE installation in a large foundry which occupies only 66 sq. ft. of floor space. A Type D of 4500 cfm capacity, located on lower platform, collects snag grinder dust. At top, a Type N of 6000 cfm capacity exhausts abrasive cleaning equipment. Dust and sludge from the two units are discharged through chutes into covered tote boxes at bottom for later disposal.

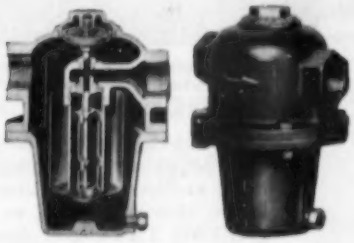
Every dust collector in AAF's complete line is a space saver. And with all this compactness, every unit is a high efficiency collector designed for constant exhaust volume and maintained performance over a wide range of operating conditions.

Remember—there is always room for modern dust control. The right equipment coupled with creative engineering thinking is certain to come up with a practical, economical solution. AAF has both. We'd like to prove it in your plant.



*herman nelson* Heating and Ventilating Units—designed for mixing, filtering and heating make-up air for exhausted areas. Available in capacities from 1200 to 26,000 cfm for steam or hot water heat.

AAF ROLL-O-MATIC—an automatic air filter featuring a renewable media filter curtain of bonded glass fibers in roll form. As clean media is introduced at top of filter, soiled material is re-rolled at bottom.



**illinois** Float and Thermostatic Traps—made in three sizes for operating ranges from 50 pounds pressure to 25 inches vacuum.

American Air Filter Company, Inc.
361 Central Avenue, Louisville 8, Ky.

I would appreciate receiving catalogs describing the following products—

- ☐ **ROTO-CLONE** Dust Control
- ☐ *Roll-o-matic* Air Filter
- ☐ **illinois** Traps
- ☐ *herman nelson* Heating and Ventilating Units

Name_____

Company_____

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City_____ State_____

**American Air Filter**
COMPANY, INC.
361 Central Avenue, Louisville 8, Kentucky
American Air Filter of Canada, Ltd., Montreal, P. Q.

# New, radio-active, automatic fire guard!

## C-O-TWO PRE-DETECTOR SYSTEM

**Each pre-detector head protects up to 3,600 square feet of area . . . harmless radio-active element utilizing ionization chamber principle quickly detects all forms of fire . . . requires only simple two-wire circuit and insignificant wall space for controls.**

This completely new and positive means of spotting fire is just what you've always needed and wanted . . . detects in the earliest stage, invisible combustion gases, visible smoke, slow smoldering, as well as open flame. The C-O-TWO Pre-Detector System is simple to install, extremely economical to maintain and doesn't depend on thick smoke or heat for actuation.

As many pre-detector heads as necessary can be connected together in a single circuit and up to 16 separate circuits or spaces handled by one system. With a single circuit the pre-detector heads are connected directly to the fire indicating cabinet, while with multiple circuits the pre-detector heads are first connected to one or more space indicating cabinets capable of visually showing by number the exact location of the fire. Relays perform such functions as sounding alarms, closing fire doors, shutting down ventilation and releasing fire extinguishing systems.

The C-O-TWO Pre-Detector System has been subjected to extensive testing and carries Underwriters' Laboratories, Inc. listing, as well as Factory Mutual Laboratories approval. Proven pilot installations have been made in such diversified properties as a television station, an electric power company network analyzer room, a railroad signal tower, an airline flight training equipment room and the offices of an insurance company.

Don't take unnecessary chances any longer . . . the extensive fire protection experience of PYRENE—C-O-TWO over the years is at your disposal without obligation. Get complete facts about this new C-O-TWO Pre-Detector System today!

Pyrene

**PYRENE — C-O-TWO**

**NEWARK 1 • NEW JERSEY**

**Sales and Service in the Principal Cities of United States and Canada**

C-O-TWO

**COMPLETE FIRE PROTECTION**

**portable fire extinguishers . . . built-in fire detecting and fire extinguishing systems**

**CARBON DIOXIDE • DRY CHEMICAL • VAPORIZING LIQUID • SODA-ACID • WATER • CHEMICAL FOAM • AIR FOAM**

# What did this change do?

*Polaroid Corporation, Cambridge, Mass. Contractor for sash replacement: W. F. Cannon Company, Boston, Mass.*

## "Owens-Illinois Glass Block* reduced air conditioning and maintenance costs, and provided better light."

*Formerly known as INSULUX

BEFORE

AFTER

When Polaroid Corporation, Cambridge, Mass., wanted to air-condition parts of this building they found that the worn window sash made it an almost impossible job. Owens-Illinois Glass Block solved the problem.

Because glass block insulate so efficiently air conditioning became possible. Heating costs were cut, too. Window pane and sash replacements are ended. Exterior attractiveness is greatly increased. The interior is flooded with diffused, natural daylight.

If you are in the process of remodeling old structures or building new ones, don't overlook the positive advantages that panels of Owens-Illinois Glass Block bring. For additional information, write Kimble Glass Company, subsidiary of Owens-Illinois, Dept. FM-8, Toledo 1, Ohio.

OWENS-ILLINOIS GLASS BLOCK
AN (O) PRODUCT

OWENS-ILLINOIS
GENERAL OFFICES · TOLEDO 1, OHIO

# Look at the "green" saved by Wolverine!

## says Mr. Friendly

Wolverine Tube, Division of Calumet & Hecla, Inc., one of the largest manufacturers of tubing, is a demon on accident prevention. In Detroit, and at its new plant in Decatur, Alabama, acclaimed the world's most modern tube mill, Wolverine puts highest priority on safety.

And it pays off. Wolverine's safety program, with the help of American Mutual Safety Engineers, has saved them $145,352 in nine years on premium and dividends. As Mr. Friendly has pointed out time and again, accident prevention and lower production costs go hand in hand. Wolverine is only one of hundreds of firms that have discovered American Mutual's safety program means lower costs, important savings and a better competitive position.

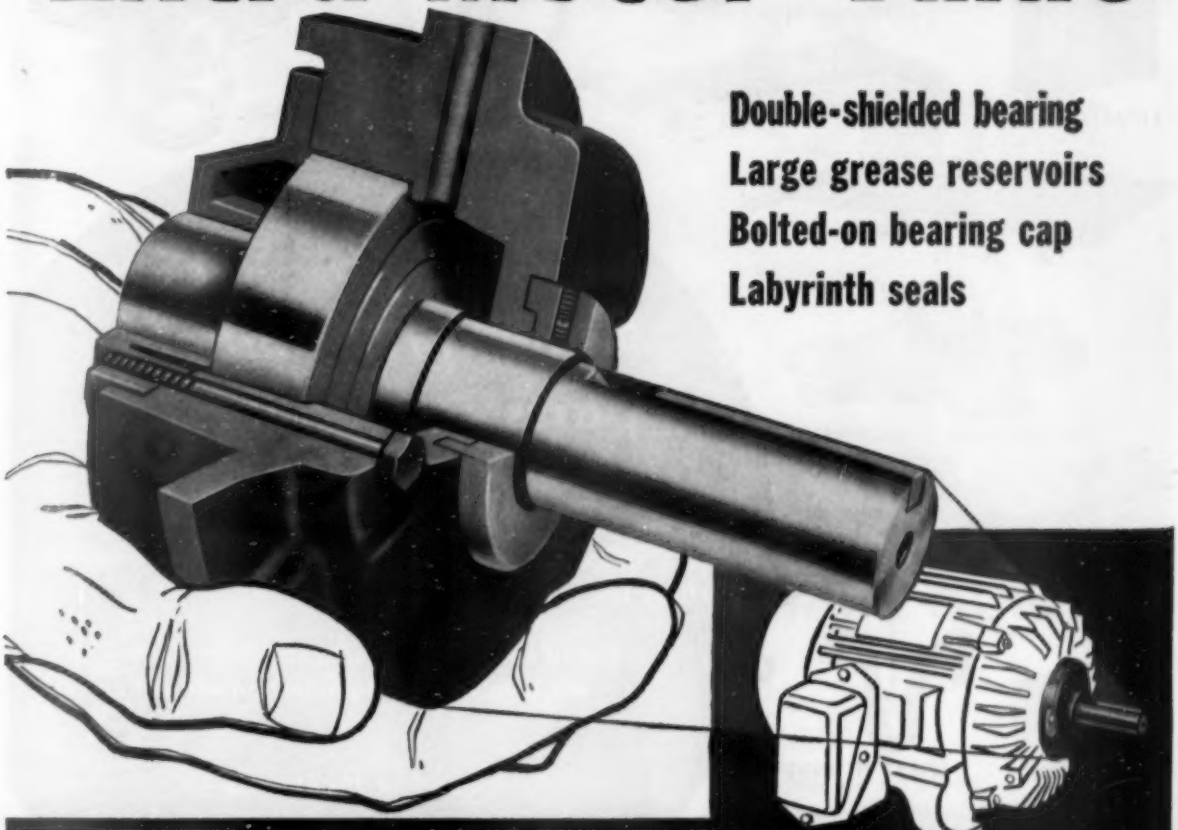
**WHY NOT SEND** for the facts on how Wolverine Tube and other companies pocketed these big savings. Write: American Mutual Liability Insurance Company, Dept. B-123, 142 Berkeley Street, Boston 16, Mass.

AMERICAN MUTUAL

*Service from salaried representatives in 78 offices!*
*Savings from regular substantial dividends!*

©1955, AMERICAN MUTUAL LIABILITY INSURANCE COMPANY

# Here Is Extra Motor Value



**Double-shielded bearing**
**Large grease reservoirs**
**Bolted-on bearing cap**
**Labyrinth seals**

## This Allis-Chalmers Bearing Design Gives More for Your Motor Dollar

The bearing cap is held tightly in place against the inner face of the bearing enclosure. This cap, with its close running clearances, keeps grease from the interior of the motor . . . retains an ample supply within the bearing enclosure.

At the outer side of the bearing, double labyrinth seals keep grease in, also keep dirt out. What's more, large grease reservoirs act as additional dirt traps.

You can lubricate these bearings without dismantling motor. Pipe-tapped holes in the bearing housings at two points provide means for inserting new grease, flushing out old grease and of relieving pressure during re-greasing.

Look for the extra bolts on the end housing . . . the sign of greater value. Ask your Allis-Chalmers representative or Authorized Distributor to show you a cutaway section of this maintenance-cutting design. Or write Allis-Chalmers, Milwaukee 1, Wisconsin, for Bulletin 51B7225.

A-4616

**ALLIS-CHALMERS**

SCRAPER FLIGHTS

BUCKETS

PULLEYS

ELEVATOR BOOTS

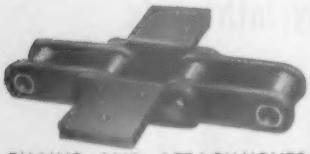
PILLOW BLOCKS

SPROCKETS

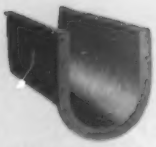
RACK AND PINION VALVES

SLATS

SLATS



CHAINS AND ATTACHMENTS

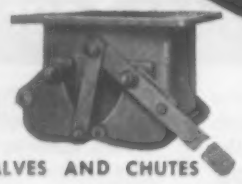


SPIRAL TROUGHS

SPIRAL FITTINGS

SPIRAL FLIGHTS

APRON FLIGHTS



VALVES AND CHUTES

BELT IDLERS

## Need replacements quickly? Standard parts carried in stock

Many large industrial concerns buy all their conveyor parts and accessory equipment from Jeffrey sales offices and distributors. You will find the complete Jeffrey line covers each item on your list.

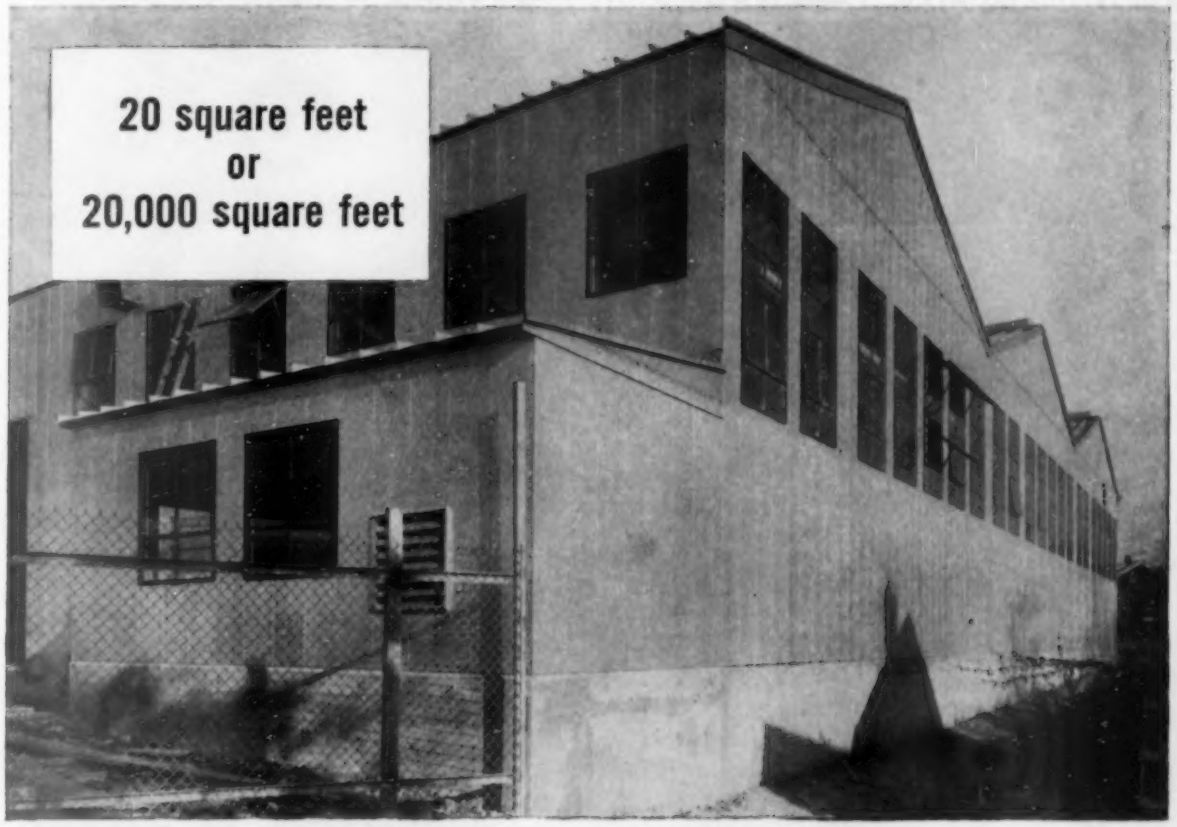
A few of the standard units are shown here — they will help you speed production and cut costs.

*Send for Booklet 832*
*which shows many types of Jeffrey stock parts.*

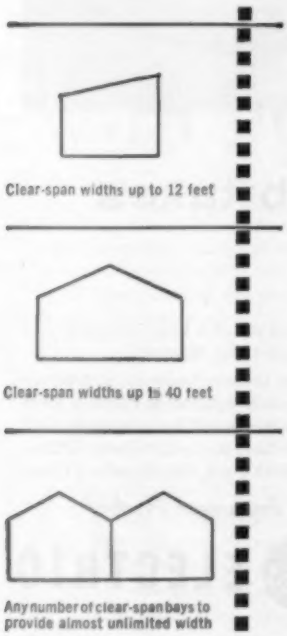
# THE JEFFREY MANUFACTURING CO.

ESTABLISHED 1877
Columbus 16, Ohio
*sales offices and distributors in principal cities*
PLANTS IN CANADA, ENGLAND, SOUTH AFRICA

**IF IT'S MINED, PROCESSED OR MOVED**
***. . . IT'S A JOB FOR JEFFREY!***




# You can get the space you need QUICKLY in an ARMCO Steel Building


Clear-span widths up to 12 feet
Clear-span widths up to 40 feet
Any number of clear-span bays to provide almost unlimited width

Armco Buildings get you indoors in a hurry. Simplified design, based on 16-inch wide steel panels, cuts erection time to a minimum. And there is practically no limit to the floor area you can get. The wide range of standard sizes, types, and combinations makes it easy to get exactly the building you need.

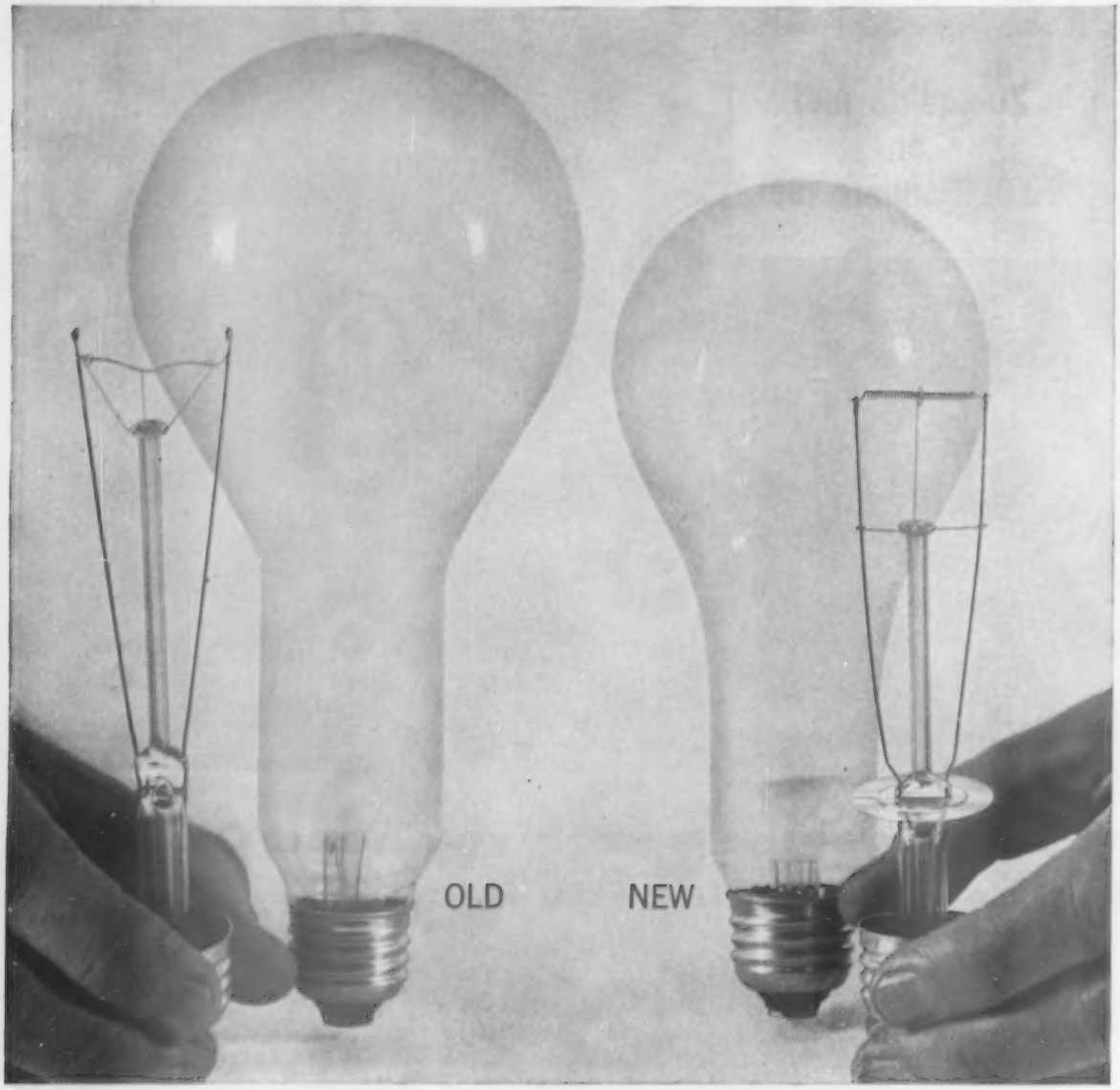
Armco STEELOX Panels lock together to form sturdy, weather-tight walls and roof. The panels provide both structural support and finished exterior. Thus you save the time and trouble of framework, rafters and sheathing. A small crew can do a quick, efficient erection job without previous experience. Work goes fast.

Low first cost isn't the only economy of Armco Steel Buildings. Because there is little or no maintenance, you'll make additional savings through the years. There is nothing to warp, crack, rot or burn. Write for details, telling us your present or planned building needs. We'll supply the information you need without obligation. Armco Drainage & Metal Products, Inc., 3885 Curtis Street, Middletown, Ohio. Subsidiary of Armco Steel Corporation. In Canada: write Guelph, Ontario. Export: The Armco International Corporation.

**Armco Steel Buildings**

ARMCO®

G-E LAMPS GIVE YOU MORE FOR ALL YOUR LIGHTING DOLLARS




# New General Electric 200-watt bulb takes less space, but gives more light

A NEW General Electric 200-watt bulb, shorter and slimmer than the old one, fits into fixtures and lamps that would formerly take nothing larger than a 150-watt bulb.

The new G-E bulb gives about 3% more light than the old one. In the new bulb, the filament is an efficient *coiled* coil, which needs only one support. The filament of the old bulb is a single coil which needs three fine-wire supports. Although these support the filament firmly, they tend to cool it and slightly reduce the light. Based on average operating costs, the extra light of the new bulb is worth 7¢ to 10¢ over the life of the bulb.

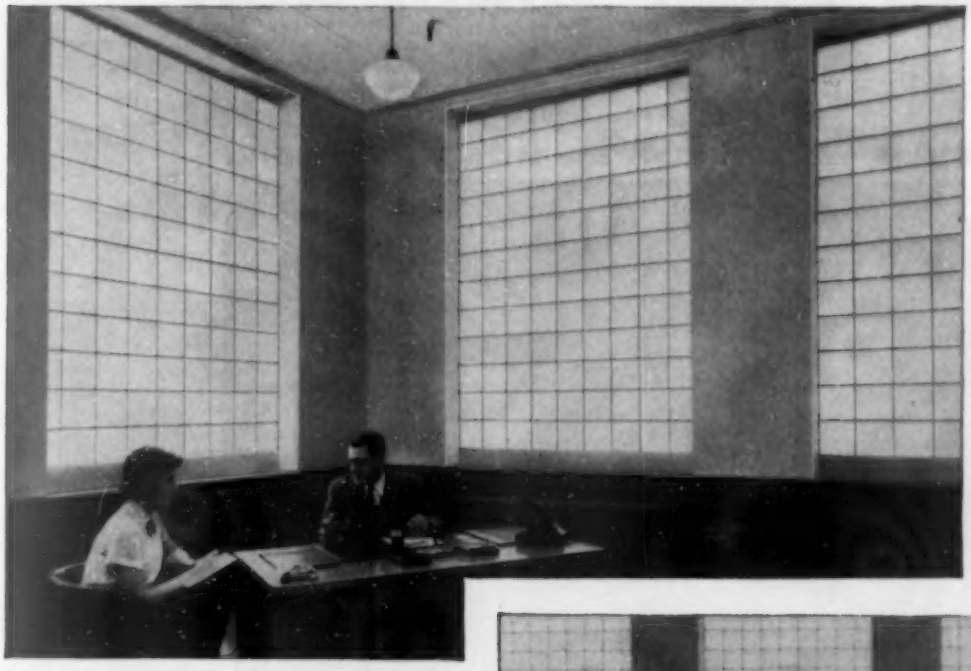
Though the new design puts the hot filament closer to the base, the new General Electric 200-watt bulb is safe to use even in paper-lined sockets. That's because of a heat-reflecting disc of aluminum between the base and the filament.

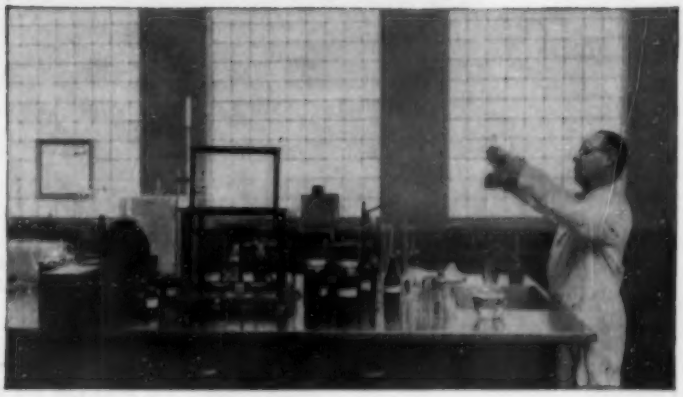
With all this extra value built in, the new bulbs list at a penny *less* than the old. For more facts on how General Electric gives you more for *all* your lighting dollars, write for a 16-page G-E progress report to lamp users. It's free, just write General Electric Company, Dept. 482-FM-8, Nela Park, Cleveland 12, Ohio.

*Progress Is Our Most Important Product*

GENERAL ELECTRIC

## ANOTHER PLANT MODERNIZES WINDOWS . . . CUTS COSTS!





# "$1050 saved the first year with PC Glass Blocks"

*says* **Myron J. Hess,** *General Manager, S. Twitchell Company, Camden, N. J.*

This is the story of a small, highly reputable manufacturer who was faced with the necessity of air conditioning his building. He ended up with not only air conditioning, but with completely modernized windows—*both for less than the air conditioning alone would have cost.*

Air conditioning was going to be a major investment, but it was discovered that by replacing the old windows with PC Glass Blocks*, the size of the air conditioning unit could be reduced from 20 to 15 tons—an immediate savings of $2800.

Other costs would also be avoided by modernizing the windows with PC Glass Blocks. To repair the existing sash would cost $2000. Window breakage cost $1000 per year, while glass blocks are seldom broken. Window washing, not needed with glass blocks, cost $250 per year. Now add it all up:

| | | |
|---|---|---|
| *Cost of PC Glass Blocks* | | *$5000* |
| *Less savings on air conditioner* | *$2800* | |
| *savings on sash repair and breakage* | *3000* | |
| *savings on washing* | *250* | *$6050* |
| *First year's direct savings with PC Glass Blocks* | | *$1050* |

In addition, steam pressure in winter was reduced from 7 pounds to 2 pounds because of the better insulation*. Window blinds, glare and dirt were eliminated. And it is estimated that employee efficiency is up 15%.

PC Glass Blocks can fit into *your* plant modernization plans, too. Write for our booklet, "How To Modernize Old Windows." Address Pittsburgh Corning Corporation, Dept. N-85, One Gateway Center, Pittsburgh 22, Pa. In Canada: 57 Bloor St. W., Toronto, Ontario.

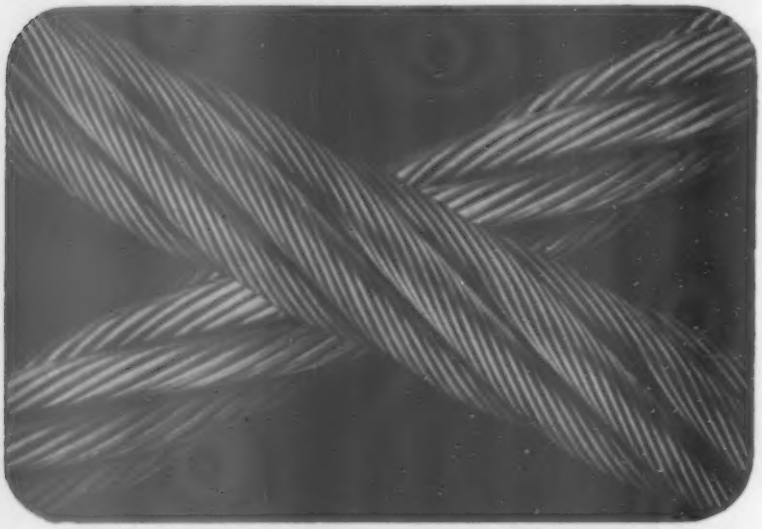
**PC Glass Blocks have twice the insulating value of ordinary windows.*

# PC Glass Blocks

® PITTSBURGH PC CORNING

ALSO SKYTROL® AND FOAMGLAS®

**FIRST WE DEVELOPED 1105 ROPE WIRE.**



**THEN WE MADE ROEBLING'S**

*Royal Blue*

WIRE 1105 ROPE

**1105** takes Royal Blue out of the ordinary wire rope class.

**1105** is a rope wire that's new—that's stronger. It's the biggest news in many years.

**1105** is the result of more than a century of research and development—it's the wire that gives Roebling Royal Blue the stamina that pays off in service.

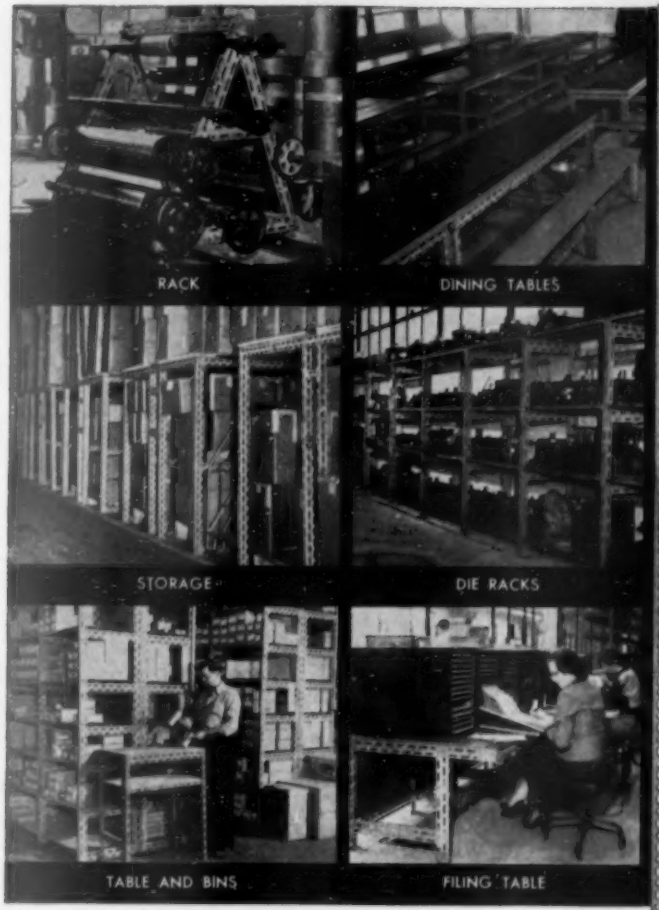
*Contact your Roebling distributor or write us for the full story.*

**ROEBLING**

*Subsidiary of The Colorado Fuel and Iron Corporation*

**JOHN A. ROEBLING'S SONS CORPORATION, TRENTON 2, N. J.** BRANCHES: ATLANTA, 934 AVON AVE. • BOSTON, 51 SLEEPER ST. • CHICAGO, 5525 W. ROOSEVELT RD. • CINCINNATI, 3253 FREDONIA AVE. • CLEVELAND, 13225 LAKEWOOD HEIGHTS BLVD. • DENVER, 4801 JACKSON ST. • DETROIT, 916 FISHER BLDG. • HOUSTON, 6216 NAVIGATION BLVD. • LOS ANGELES, 5340 E. HARBOR ST. • NEW YORK, 19 RECTOR ST. • ODESSA, TEXAS, 1920 E. 2ND ST. • PHILADELPHIA, 230 VINE ST. • SAN FRANCISCO, 1740 17TH ST. • SEATTLE, 900 1ST AVE. S. • TULSA, 321 N. CHEYENNE ST. • EXPORT SALES OFFICE, 19 RECTOR ST., NEW YORK 6, N. Y.

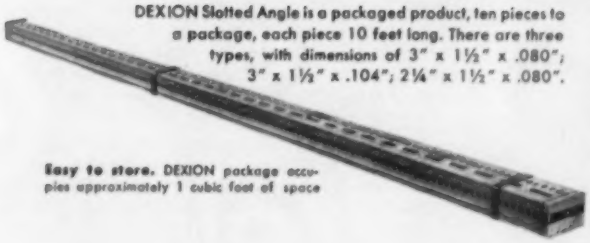
# how many uses for DEXION in your plant?



Easy to cut. One stroke of DEXION cutter saves time.
Simple to connect. Use only two wrenches.
DEXION panels. For shelving to support heavy loads.
Re-usable. Dismantle—rebuild into other equipment.

## Here's why you'll want DEXION Slotted Angle over any other framing material

Only your imagination limits the applications of this ingenious slotted angle framing material. Users discover that they can build whatever they need—when they need it—and build it cheaper! Easily dismantled, DEXION Slotted Angle can be *reused* in new ways to meet changing needs. There's no waste! And anyone who can use a wrench and a saw (or DEXION cutter) can build with this precision-made slotted angle.



**DEXION Slotted Angle is a packaged product, ten pieces to a package, each piece 10 feet long. There are three types, with dimensions of 3" x 1½" x .080"; 3" x 1½" x .104"; 2¼" x 1½" x .080".**

**Easy to store.** DEXION package occupies approximately 1 cubic foot of space

**GET the exciting new DEXION IDEA BROCHURE, which gives you full information. Write direct to the address shown below, Dept. 8A.**

DEXION DIVISION

## ACME STEEL COMPANY

2840 ARCHER AVENUE, CHICAGO 8, ILLINOIS

ACME STEEL

# No thief can beat this alarm system!

TRY as they might, thieves simply cannot fool the new Kidde Ultrasonic Burglar Alarm System!

Unlike conventional devices, which furnish only perimeter protection, the Kidde system gives *complete* wall-to-wall, floor-to-ceiling coverage, guarding *every single inch* of the area you want protected!

Filling a room with waves of sound too high to be detected by the human ear, the Kidde system protects *all* of the following 5 possible points of entry!

**FLOORS, WALLS AND CEILINGS!** Let a thief try chopping through the floor, walls or ceiling, and he's as good as in jail. Even if a thief conceals himself in the protected area, his first move will give him away. And, if power fails or if someone tries to sabotage any of the system components, tamper-proof devices instantly sound the alarm!

**WINDOWS!** Forcing a window within the protected area will trigger the alarm *immediately*. Here, a thief is stopped before he starts.

**DOORS!** With the Kidde system on the job, the slightest opening of a door sounds the alarm immediately, stops any thief in his tracks. No way of entry here!

**HERE'S HOW IT WORKS:** Transmitter sends out waves of sound too high to be detected by the human ear. Receiver listens for possible disturbances of waves. If waves are disturbed in any way, electronic "brain" triggers alarm.

*Operating from a standard electrical outlet, the Kidde Ultrasonic Burglar Alarm System requires no permanent, expensive wiring, can be moved from place to place with little trouble. For more information on this economical foolproof protection, send today for Kidde's Ultrasonic Alarm System Booklet.*

**Kidde** (K Kidde)

The words 'Kidde', 'Lux', 'Lux-O-Matic', 'Fyre-Freez' and the Kidde seal are trademarks of Walter Kidde & Company, Inc.

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**832 Main Street, Belleville, 9, N. J.**
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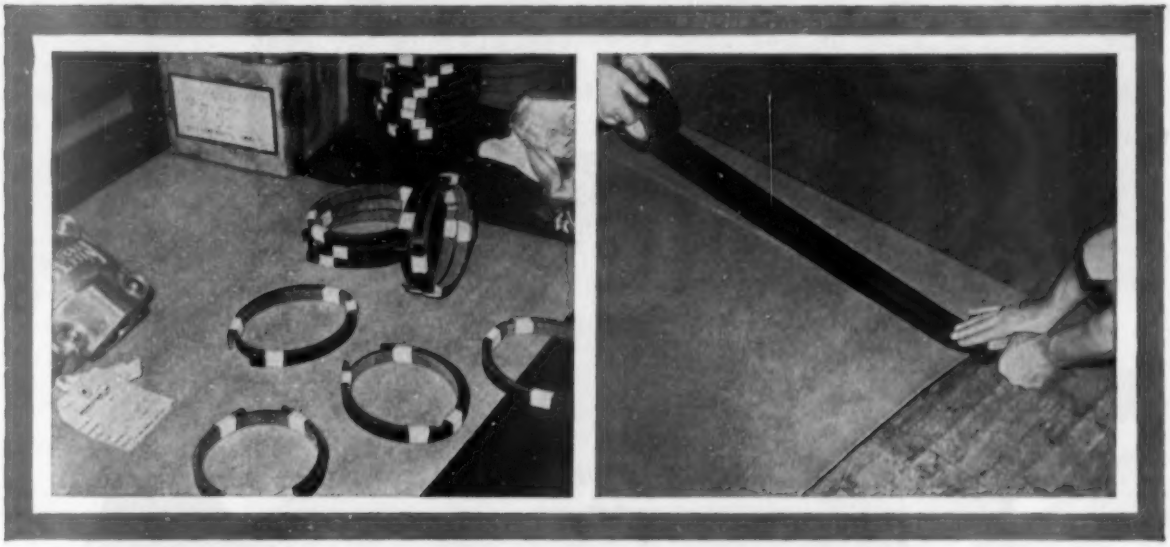
# Polyken TAPES

CONTROLLED STRENGTH

## KEEP RINGS IN SHAPE, PADDING IN PLACE



These compact coils in the left-hand picture are hydraulic cylinder packing rings. If you took off the strips of *Polyken* Tape that hold them, they'd tend to straighten out. That would make them hard to handle and they'd take a lot more shipping and storage space too.

The other picture shows *Polyken* Tape at work on a different kind of holding job. There a pad of sponge rubber is being put down as a cushioning underlay for carpeting. The sponge rubber is cut to fill in and follow the shape of the room. *Polyken* Tape holds these pieces together, joins them together with a neat and permanent seam, keeps them from slipping out of place once the carpet has been laid.

The tape requirements for these two jobs are not the same. Neither are the conditions under which they are used. To meet the requirements for specific jobs, *Polyken* Tapes have *controlled strength*—the proper combination of adhesive and backing. You use the *controlled strength* required for your job. It's done right and it's done without waste.

The coupon below will bring you complete information.

Polyken®

INDUSTRIAL TAPES

Polyken Products Department of The Kendall Company

*Polyken*, Dept. FM-H
222 West Adams St., Chicago 6, Illinois

Please send me physical properties and further information on *Polyken* Controlled Strength Tapes.

Name_____ Title_____

Company_____

Street Address_____

City_____ Zone____ State_____

"Okay—we'll reorder by airfreight and keep down our parts supply. Problem now is what carrier do we use?"

"American! Traffic manager says they can give us the best service from our various suppliers. Says American covers more industrial centers than any airline!"

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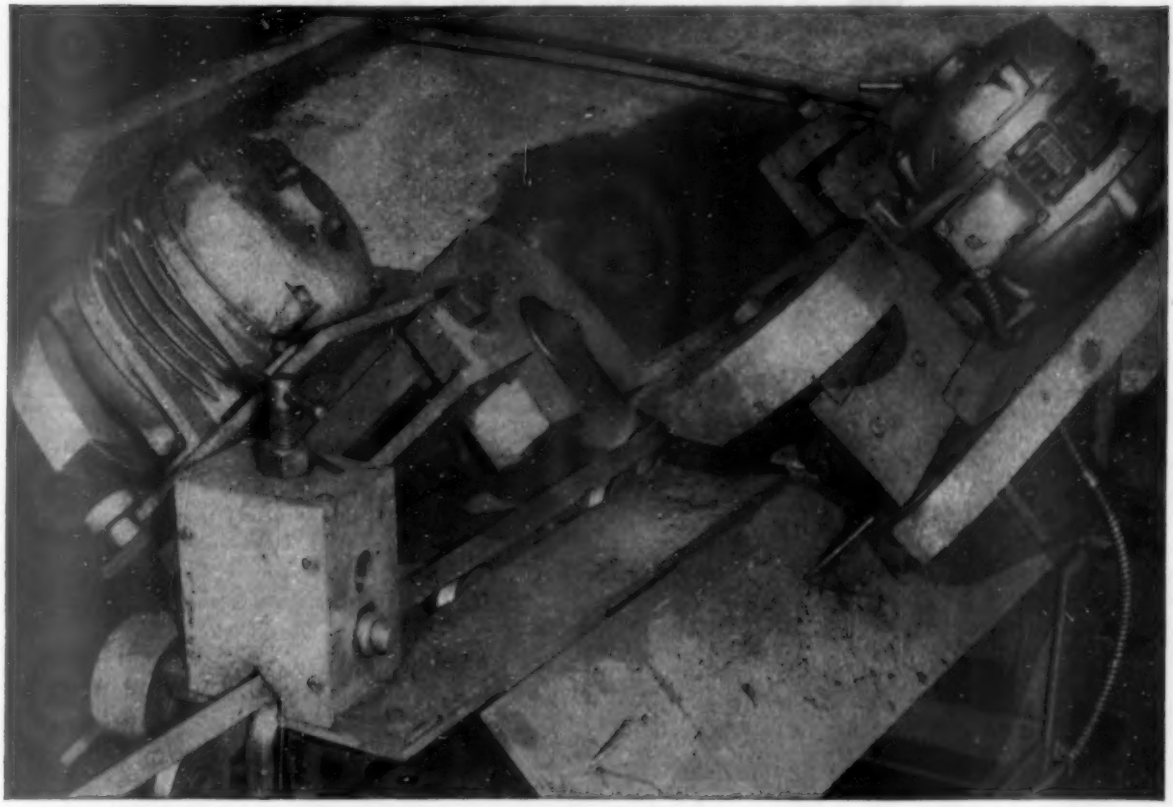

# FAST PASS STRIPS SCALE

## to save money on material!

*A cost-reducing idea an OBA can duplicate in your plant*

This manufacturer takes advantage of a price differential by buying a grade of angle iron that still has mill scale on it.

**The Problem:** How to remove this hard scale and still save money over purchasing a more costly grade of steel that has been pickled.

**Here's what they do:** The angle iron bars are fed through a simple brushing machine against two Osborn Master® Wheel power brushes. In one pass, these Osborn Brushes effectively remove the hard, flint-like scale . . . at a rate of 150 feet a minute.

The strips come clean, ready for production.

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Scale is gone. Surface is clean, ready for use.

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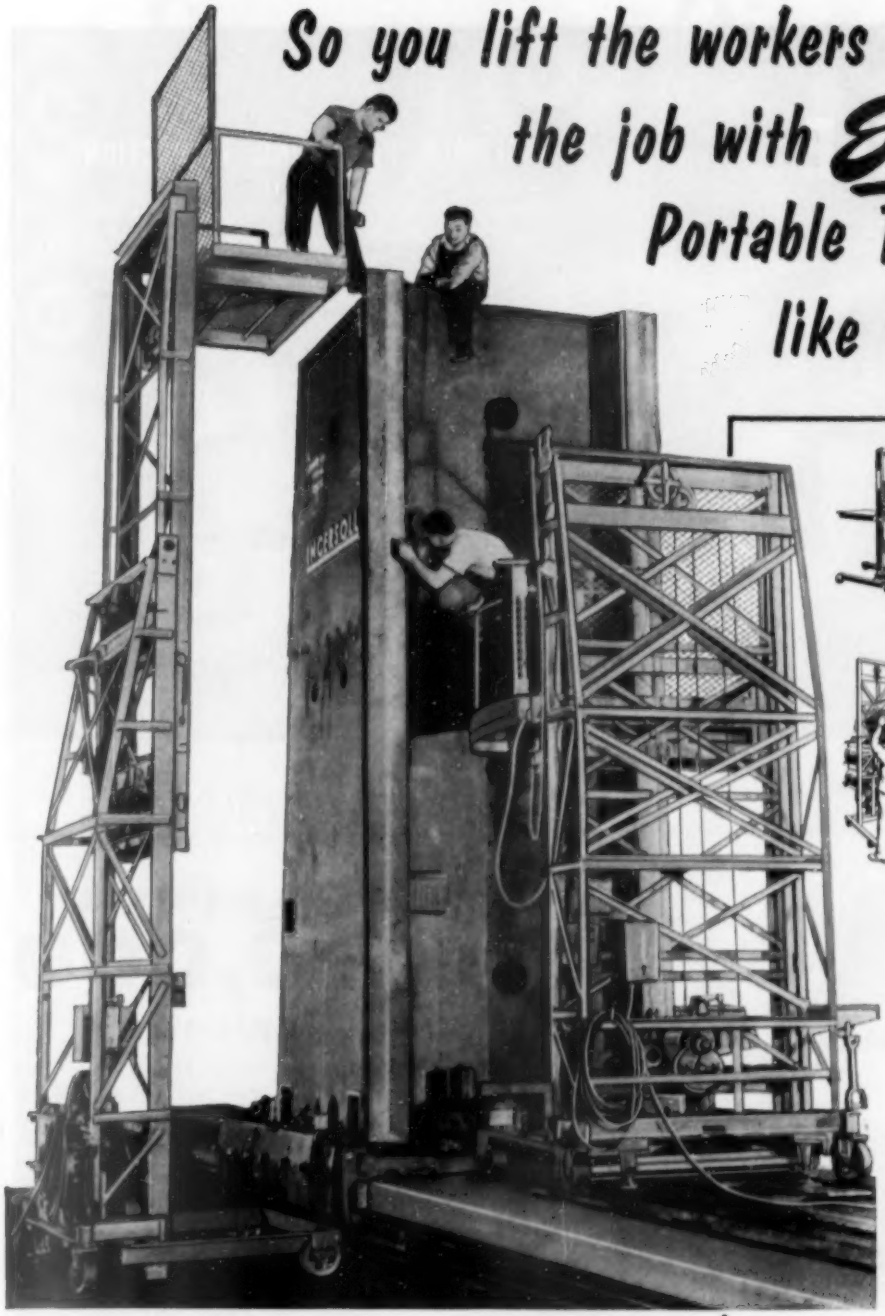
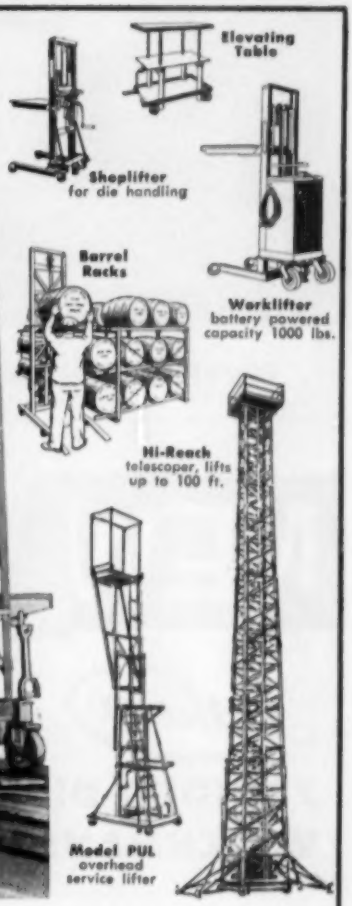
**DAZOR FLOATING LAMPS**

# So you lift the workers right up to the job with Economy Portable Telescopers like this

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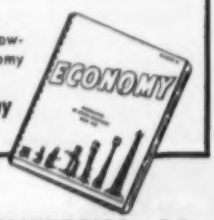


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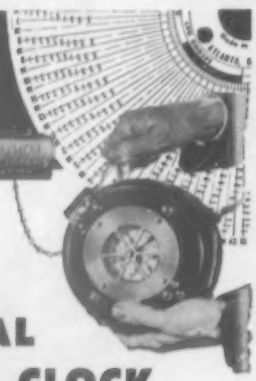

*Lathem*

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• Durable protection against chemical fumes and spillage, mildew, abrasion and saponification was needed for the new sewage plant in Rochester, Minnesota—world-famous medical center. That's why consulting engineers Tolz, King & Day, St. Paul, Minnesota, specified sturdy Inertol coatings for every surface to be painted.

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**• prevents and inhibits rust • covers 400-500 sq. ft./gal./coat • never gets sticky because it's hygroscopically controlled • resists fading, regardless of weather • comes in 11 glossy colors**

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INERTOL... A complete line of Industrial Maintenance coatings

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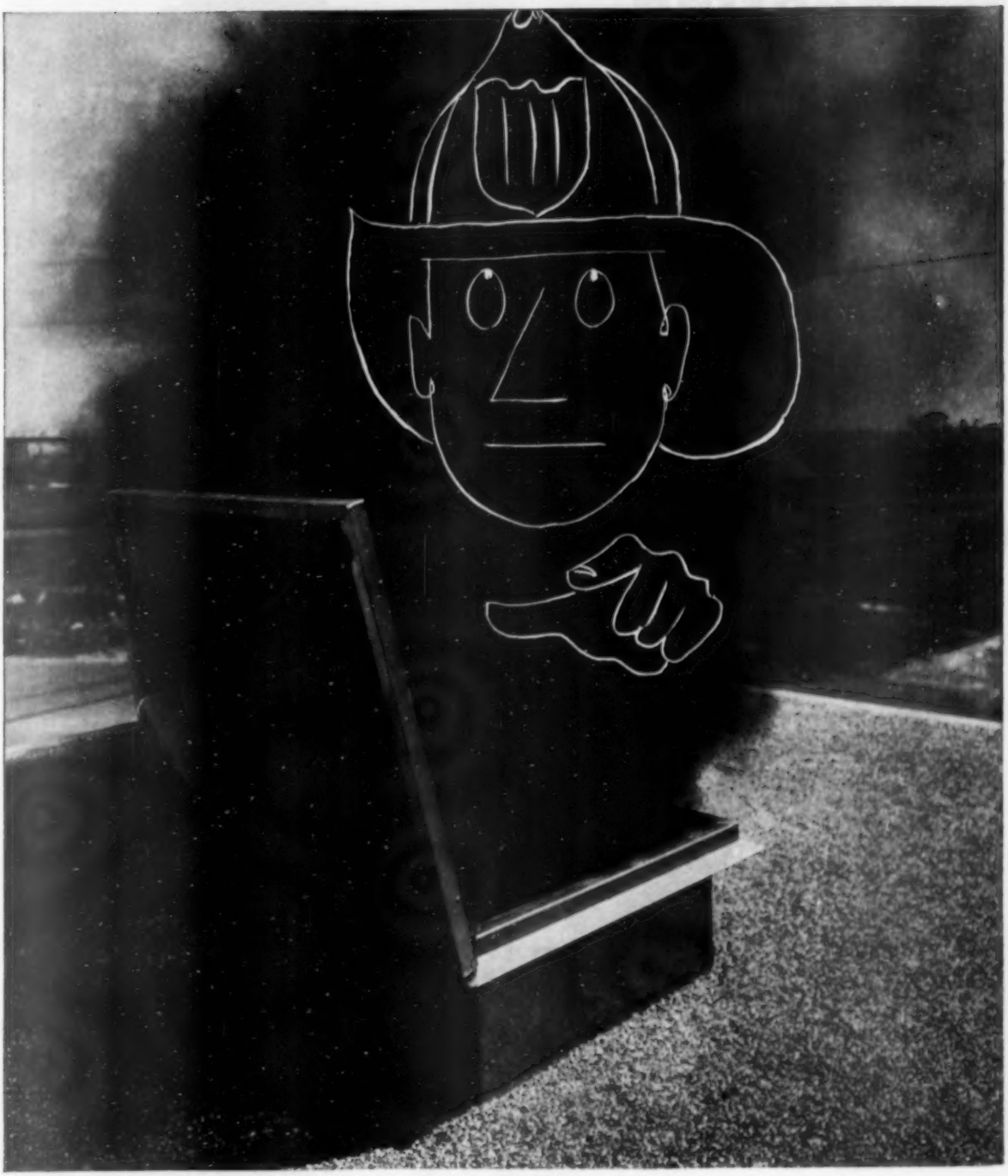

Automatic fire venting with WASCOLITE PYRODOMES could mean the difference between damage and disaster in your plant.

If you are concerned with your plant's safety, look into this proven, recognized fire protection technique today.

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Bay State Road • Cambridge, Massachusetts

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**Over fifty years of leadership in air conditioning have given Carrier unmatched experience in the control of temperature—heating as well as cooling. Yes, Carrier knows heating by experience—and all this engineering skill and leadership contributes to the superiority of Carrier Unit Heaters.**

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**This compact, versatile unit "blankets" door openings with a wall of warm air. Unique down-flow, warm-air outlet can be installed to extend across the top of the door. A full-width air blanket blasts warm air all the way to the floor. Unit can be thermostatically controlled to operate only while door is open. It keeps cold out, prevents drafts and saves fuel. It is ideal for open shipping doors. Sectionalized construction makes installation easy.**

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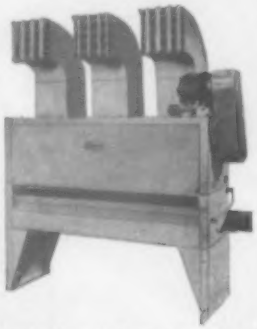

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Please send folders on features and selection data for Carrier Heating and Ventilating Units and Heat Diffusers.

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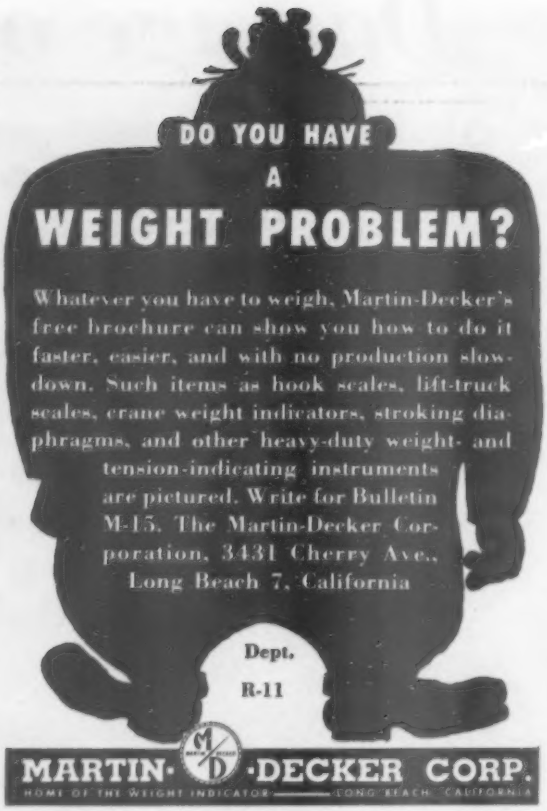
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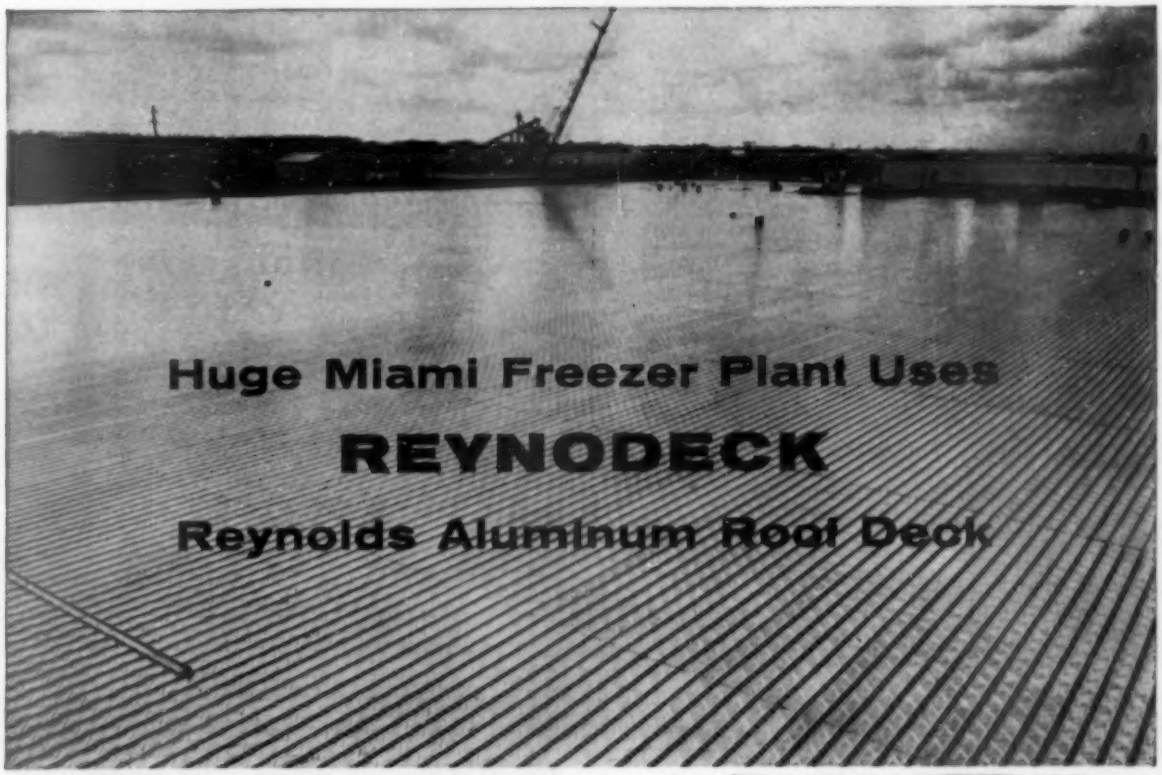


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**A complete installation service is available. For name of nearest franchised jobber-erector, call the Reynolds office listed under "Building Materials" in classified phone books of principal cities. Or write to Reynolds Metals Company, Building Products Division, 2007 S. Ninth St., Louisville 1, Kentucky.**

**Specifications:**

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| **Width:** | Over-all 25", nominal coverage 24". |
| **Ribs:** | 1.75" deep, spaced 4.8" on center. |
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**REYNOLDS ALUMINUM**
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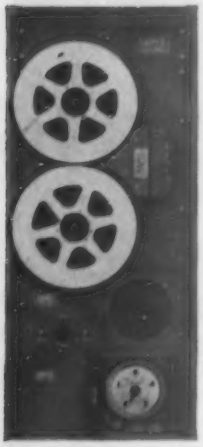
## with Ampex's new music system



It lessens boredom—reduces midmorning slumps—cuts absenteeism and turnover. Ampex background music plays right in your plant, time-clock controlled. You preset the on-off music periods (short as 5 minutes if you wish).

Music is on 8 hour reels of tape—superb quality—no needle scratch—no worn and muddled sound. There's a microphone for public address and paging too. All your sound is in one system—no complicated hookups—and music is faded automatically for announcements.

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**G-E molded case circuit breakers are built to meet 16 quality tests, are U/L listed**

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**3. Safe, positive protection** against short circuits and sustained overloads with both thermal and magnetic trip.

**4. Reduces costly production delays.** Positive indication of "on," "off" or "tripped" permits speedy restoration of service.

**5. Trip free.** Cannot be held closed during a short circuit.

**6. Installation simple and quick** because of solderless lugs and straight-in wiring.

**7. Factory sealed against tampering** in sturdy, molded case.

**8. Electrically and mechanically tested 16 ways** for durability, safety, reliability and for accurate tripping time.

**9. Available with all standard accessories** for flexible use throughout industry.

**10. Prevents single phasing.** Common trip opens all legs of circuit.

Enclosed circuit breakers can be locked on or off, are quickly installed. Enclosures for every purpose, including lead-plated water-and-dust-tight enclosure for corrosive atmospheres. Available from your G-E Trumbull Distributor. *Trumbull Components Dept., Section 8, General Electric Company, Plainville, Conn.*

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**DISPLAYED** —RATES— **UNDISPLAYED**

The advertising rate is $24.80 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

An advertising inch is measured ⅞" vertically on a column—3 columns—30 inches to a page.

Subject to Agency Commission.

$1.80 per line, minimum 3 lines. To figure advance payment count 5 average words as a line.

Box Numbers—counts as 1 line.

Discount of 10% if full payment is made in advance for 4 consecutive insertions.

Not subject to Agency Commission.

**Send NEW ADS to FACTORY MANAGEMENT & MAINTENANCE, 330 W. 42nd St., N. Y. 36, N. Y. for September issue closing August 15th**

## EXECUTIVE MAINTENANCE ENGINEER

Unusual opportunity. Large well-known manufacturer operating over 40 plants has opening for graduate mechanical engineer as administrative assistant on staff of the Vice President of Manufacturing consulting on maintenance programs and planning. Qualified applicant must have at least 10 years experience in the field of plant engineering planning preventive maintenance and cost reduction programs. Must be capable of organizing, administering, and evaluating maintenance programs of multi-plant operations. Chicago headquarters with some travel to plants. In replying, state age, education, experience, and salary requirement.

**P-6986, FACTORY MANAGEMENT & MAINTENANCE**
**520 N. Michigan Ave., Chicago 11, Ill.**

### FOREMAN

Position open with food manufacturer for a man to control Preserve, Jam and Jelly Department. Individual must have had several years experience with vacuum pan processing. Reply stating age, experience and salary desired and when available.

**P-7162, FACTORY MANAGEMENT & MAINT.**
**330 W. 42 St. New York 36, N. Y.**

### PLANT LAYOUT ENGINEER

Large Wisconsin food processor. Will work with production departments and industrial engineers on layout matters. Degree essential. Desire man in early stages of engineering career with good advancement potential.

**P-7151, Factory Management & Maintenance**
**520 N. Michigan Avenue, Chicago 11, Illinois**

### INDUSTRIAL ENGINEERS

Industrial Engineering candidates with up to five years' industrial experience required by large national manufacturer for excellent, permanent industrial engineering assignments. Send details including experience, age, salary requirements, etc., to

**P-7074 FACTORY MANAGEMENT & MAINT.**
**330 W. 42 St., New York 36, N. Y.**

### STAFF MANAGER STANDARDS

Major processor has general staff position available for man experienced in establishing standards and controlling yields in processing operations. As staff head will have administrative responsibilities for formulation of policy and operations in each of the Company's plants. Minimum 7 years experience in this field. Salary in area of $10,000, however, dependent upon individual's qualifications. Send complete resume to

**P-7214, FACTORY MANAGEMENT & MAINT.**
**330 W. 42 St. New York 36, N. Y.**

### OPPORTUNITIES FOR ENGINEERS IN THE INDUSTRIAL ADVERTISING AND TECHNICAL WRITING FIELD

Are today almost unlimited. If you are under 35 years old, like to write, have a technical background, and want a career in industrial advertising, we have an opening for you that offers big opportunities. Ability to write and salesmindedness are essential. Write to us. We will give you more details.

**P-6561, FACTORY MANAGEMENT & MAINTENANCE**
**330 W. 42nd St., New York 36, N. Y.**

### DIV. MANAGER or SUPERINTENDENT

with heavy processing or precision parts for machining. Supervision exp. Degree necessary. Age 30 to 40.

**$7,500-$10,000 Plus.**
**CONTACT J. J. COOPER**
**O'SHEA EMPLOYMENT SYSTEM**
**"America's Largest"**
**64 E. Jackson, Chicago, Ill. Tel. WAbash 2-1884**

## EMPLOYMENT

REPLIES (Box No.):
Address to office nearest you
NEW YORK: 330 W. 42 St. (36)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

### SELLING OPPORTUNITY OFFERED

**Manufacturers Agent Opportunity: Pressure** sensitive industrial tape line. Exclusive territories open. List current territory, lines carried and biography. Write RW-6925, Factory Management & Maintenance.

### POSITIONS WANTED

**Industrial Relations — challenging position** desired by young married man, soon to be discharged. B.S., A.M., plus intense interest. PW-6288, Factory Management & Maintenance.

**Industrial Engineer—College graduate; 3 years'** supervisory responsibility; knowledge of accounting procedures; age 26; married; completing service in December. PW-6944, Factory Management & Maintenance.

**Design Draftsman plant layout, piping, press** vessels also industrial plumbing versatile, 25 years experience, age 49. PW-7121, Factory Management & Maintenance.

**Production Executive—Employed as Gen. Supt.** Experienced in industrial and plant engineering and labor relations. BSME, MBA, age 37. Desires Plant Manager or similar position. Resume on request. PW-7154, Factory Management & Maintenance.

**Young manufacturing executive (30) seeks chal**lenging growth opportunity. Six years sound, diversified industrial experience as Assistant to General Manager, production manager, industrial engineer, personnel manager. Proven record of leadership, production expansion, savings, cost reduction, trouble-shooting. PW-7187, Factory Management & Maintenance.

**Maintenance or Plant Engineer B.S. Chem. Eng.** 1941 experienced in plant engineering, project engineering and plant construction. Presently in charge of maintenance of plant utilities. PW-7173, Factory Management & Maintenance.

## DRAKE PERSONNEL

**National Placement Center for**
**EXECUTIVE AND TECHNICAL PERSONNEL**

***General and Plant Managers***
***Plant Superintendents—Foremen***
***Accounting—Staff Personnel***
***Engineers: Design—Production***
***Sales Managers—Engineers***

*Please outline briefly your experience or personnel needs to:*

**John Cope**
**220 S. State St., Chicago 4, Ill.**
**HArrison 7-6600**

### SALARIED POSITIONS $5,000—$35,000

We offer the original personal employment service (established 45 years.) Procedure of highest ethical standards is individualized to your personal requirements. Identity covered; present position protected. Ask for particulars.

**R. W. BIXBY, Inc.**
**660 Brisbane Bldg., Buffalo 3, N. Y.**

### EXECUTIVES AND TECHNICAL MEN

*Desiring Positions with Stability*

We solicit inquiries from qualified candidates who desire to contact employers for positions paying $5000 to $25,000 per year. Confidential. Est. 39 years.

(Inquiries from Employers entail no obligation)
**THE NATIONAL BUSINESS BOURSE**
**20 W. Jackson Blvd., Chicago 4**

### POSITIONS AVAILABLE

Plant Mgr. Fabrication & Welding $16,500; Supt. Tanks—Boilers $10,000; Director Purchasing Capital goods $15,000; Plant Layout Engineer $9000; Master Mechanic Mchy repair $10,000; Supt. Screw mchns $9000; Manager of Plants Paper Converting $20,000; Chief Engineer Trucks $9500. Employers pay fees mostly. Confidential. Estab. 40 yrs.

**HARRISON PERSONNEL SERVICE**
**20 W. Jackson Blvd. Chicago 4, Ill.**

## PROD. CONTROL MGR.

**STARTING RANGE — $650-800**

Smaller company—500 employees—product, air conditioners—age to 40—capable—good experience—further opportunity.

**RAY EDWARDS AND ASSOCIATES**
**28 E Jackson—Webster 9-2905—Chgo 4, Ill.**

### PLANT MANAGERS, ENGINEERS, SUPERVISORS

A confidential, nationwide placement service for manufacturing executives who are presently employed and wish to better themselves. Write giving age, education and previous experience. We will let you know, at once, how we can help you.

**GRAEBNER'S EXECUTIVE EXCHANGE**
**"The Nation's Largest"**
**116 S. Michigan, Chicago 3, Illinois**

### MANAGER NEW PRODUCTS DEVELOPMENT ENGINEERING

You will head development division of midwestern company manufacturing automotive and construction equipment. This is mechanical, electro-mechanical and hydraulic research. Reports to V.P. of Manufacturing.

Starting salary $9000-$15,000. All fees and expenses assumed by employer.

**28 E. JACKSON CHICAGO 4, ILLINOIS**
**MONARCH PERSONNEL**

# CLASSIFIED SEARCHLIGHT SECTION ADVERTISING

BUSINESS OPPORTUNITIES — EQUIPMENT - USED or RESALE

**RATES**

**UNDISPLAYED**

$1.80 a line, minimum 3 lines. To figure advance payment count 5 average words as a line.

PROPOSALS, $1.80 a line an insertion.

BOX NUMBERS count as one line additional in undisplayed ads.

DISCOUNT of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

**DISPLAYED**

The advertising rate is $19.80 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

AN ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns 30 inches—to a page.

EQUIPMENT WANTED or FOR SALE ADVERTISEMENTS acceptable only in Displayed Style.

*Send NEW ADVERTISEMENTS to N. Y. Office, 330 W 42nd St., N. Y. 36, N. Y. for September issue closing August 15th.*

---

**NEW GORTON P2-3**
**Pantograph Miller and 375-3 Gorton Cutter Grinder**

Plus attachments for sale at attractive discount. Equipment never used.

**FS-6863, FACTORY MANAGEMENT & MAINT.**
**330 W. 42 St., New York 36, N. Y.**

---

**USED CRANES WANTED**

Used Cranes, box or fish-belly type—5—10 and 15 ton capacities. Spans 57 ft. 6 in., 44 ft. 11½ in., 32 ft.

*Wire or write*

W 7083 FACTORY MANAGEMENT & MAINT.
520 N. Michigan Ave., Chicago 11, Ill.

---

*PERSONNEL MANAGERS*

## LOOKING FOR ENGINEERS . . . TECHNICIANS?

*Write for free copy of*

**"RESERVOIR OF ENGINEERS AND TECHNICAL MEN"**

The engineers and technicians you want to reach are gathered in convenient, compact groups—as this 12-page booklet points out.

It keys the job titles these men hold to the McGraw-Hill publications they read for on-the-job information. It explains how you can make contact . . . channel concentrate your employment advertising to just the men with the job qualifications you want.

***Write for your free copy to***

Classified Advertising Division
McGraw-Hill Publishing Co., Inc.
330 W. 42nd St., N. Y. 36, N. Y.

---

**save 75%**

**U. S. NAVY SURPLUS**

# AXIAL FLOW FANS

**NEW AND UNUSED**

***for the control of***

**FUMES • STEAM • ODORS • DUST • VENTILATION**
**COOLING OR DRYING WORK IN PROCESS**
**FORCED COOLING OF MOTORS • TRANSFORMERS & PROCESS EQUIPMENT**

HEAVY STEEL CONSTRUCTION — — WEATHER PROOF
INTERIOR PRIMED & VARNISHED — — EXTERIOR DOUBLE PRIMED

MODEL @A16A-6W8
16,000 C.F.M. @ 3" S.P.
POWERED BY 15 H.P., G.E., 440 VOLT-60 CYCLE-3 PHASE-TOTALLY ENCLOSED WEATHER-PROOF MOTOR
BODY DIAMETER 31"
DRILLED FLANGES 35¼" DIAM.
BODY LENGTH 38"
WT. APPROX. 850 LBS.

**save 75%**
ACQUISITION COST OVER $1600 EACH
Write For Price & Quantity Discount
F.O.B. READING, PA.

**16,000 C.F.M.**
@ 3" STATIC PRESSURE

WEATHER PROOF MOTOR

MILLS—MINES
CHEMICAL PLANTS
FOUNDRIES
STEEL & NON FERROUS METAL WORKING PLANTS
POWER PLANTS
MACHINE SHOPS
FABRICATING SHOPS
FOOD PROCESSORS

SUITABLE FOR EITHER HORIZONTAL OR VERTICAL MOUNTING

***May we ship you a sample order?***

Industrial Equipment Division of
LURIA BROTHERS & COMPANY, INC.
600 PHILADELPHIA NATIONAL BANK BLDG • PHILADELPHIA 5, PA. • Rittenhouse 6-7455

---

# —TRANSFORMERS—

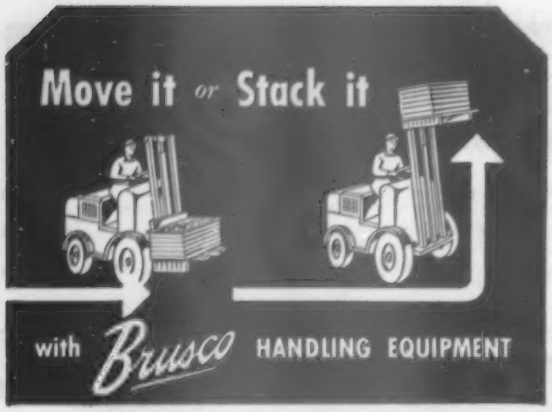
**BOUGHT AND SOLD**

**We carry a large stock of rebuilt and guaranteed transformers, and invite your inquiries.**

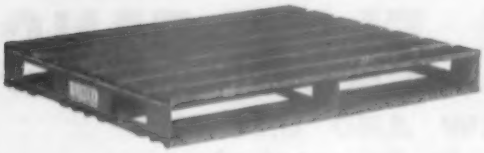
**Custom-built transformers and coils manufactured to your specifications.**

**Expert Repair Service—all makes and sizes of transformers rewound, repaired and redesigned. Ask for our price schedule.**

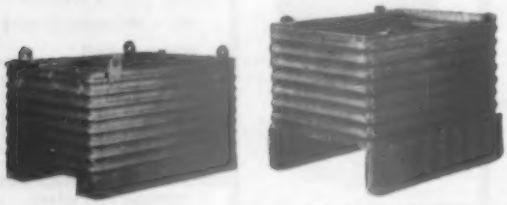
**THE ELECTRIC SERVICE CO., INC.**
**5321 Hetzel St.** **Cincinnati 27, Ohio**
***40 Years' Dependable Service***




**No. 930 BRUSCO PALLET**



For general use in moving and stacking materials, cartons and containers. Special attention is called to large bearing surface of the bottom of the pallet. This feature assures easier and safer handling and makes the pallet adaptable for many uses. Fabricated of heavy or light gauge steel depending on your requirements. Simplicity of design and rugged welded construction make for long productive life with no maintenance cost. Can be furnished with or without fork openings for 4-way entry.



No. 558 No. 559

**BRUSCO Corrugated Skid Boxes**

*Also manufacturers of:*

**BOXES - SKIDS - PALLETS - RACKS**

**BRUSCO self dumping hoppers**

***When requesting price information, please give dimensions, load capacities and quantities.***

Brusco HANDLING EQUIPMENT

BRUMMELER STEEL PRODUCTS CORP.

1408 Ionia Ave., S. W., Grand Rapids, Mich.


# Want Some Real Job Help?

Here's a list of reprints which have already proved their value to FACTORY readers.

The subjects covered in these reprints are varied. Many of them you might wish to have for your own personal library. Others you may want to order in larger quantities for distribution to people in your organization. All the articles listed here in stock, in limited quantities. First come, first served.

Write to: Editor, FACTORY

**How to Use Your Time Better**
**How to Improve Your Memory**
**How to Rough Sketch Your Ideas on Paper**
**How to Read Faster and Better**
**Tips on Talking Better**
**Work Sampling****
**Sonic Energy****
**How You Can Use Radioisotopes****
**How Good A Leader Are You At Getting Better Production**
**How to Pick People Better**
**Telling Employees Where They Stand**
**How Good a Leader Are You**
**How to Solve Your Parking Problems**
**Organizing for Disaster**
**How to Protect Your Plant**
**Disaster Without Warning**
**How Fixed Variable Cost Control Helps Produce Profits**
**Special Report on Incentives for Supervisors**
**Worker Psychology—A Formula That Works**
**Predetermined Time Standards**
**How to Write Better Letters to Employees**
**Electronic Controls**
**Cuts Rejects and Inspection Cost**
**G M's Fire****
**Merit Rating Plan for Executives**
**How to Be Interviewed**
**Operations Research**
**The Sad Case of Company X**
**What to Do When the Union Knocks at Your Door**
**Factory's Cost Index****
**Role Playing in Training Supervisors**
**Six Steps to Better Inventory Management**
**Make Statistical Methods Easier to Understand**
**Your Ideas: How to Put Them Across**
**Nine Steps to Better Quality**
**Work Sampling Without Formulas**
**Followership—New Step to Better Leadership**
**How's Your Health?**
**Get Tooled Up Now to Cut 1955 Costs**
**How to Think and Act Like an Executive**
**How to Start a Training Program from Scratch**
**10 Tools to Control Vendor's Quality**
**Squeeze Is on the Production Supervisor**

Prices for all reprints listed above, except those starred, are:

| | |
|---|---|
| Single copies — 35¢ each | **Single copies — 50¢ each |
| 100-299 copies — 25¢ each | 100-299 copies — 35¢ each |
| 300-499 copies — 20¢ each | 300-499 copies — 25¢ each |
| 500 copies up — 15¢ each | 500 copies up — 20¢ each |

Shipping charges will be added to all orders for over 50 copies.

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DE LAVAL *Centrifugal Pumps*

DE LAVAL STEAM TURBINE COMPANY

*804 Nottingham Way, Trenton 2, New Jersey*

DL 201

WRITE FOR BULLETIN 1125-B

## HERE'S A HANDY POSTCARD THAT WILL HELP YOU—

# GET MORE INFORMATION

### How to use this Reader Service Card . . .

The bottom of this page is a postcard—you'll note that the page has been perforated so you can tear it out easily. This postcard makes it easy for you to get more information on anything that's advertised in FACTORY, or listed in FACTORY's *Catalog News, Equipment News,* and *Materials News Sections.*

**Catalog News Section:** Starts on page 134. FACTORY's Editors look at scores of catalogs each month, and select those that will be most helpful to you. In the Catalog News Section of the postcard, circle the numbers corresponding to the numbers of the catalogs you want. You'll get them—without obligation—direct from the manufacturer.

**Equipment News Section:** Starts on page 136. Here FACTORY's Editors describe various kinds of new equipment that will help you solve plant problems. In the Equipment News Section of the postcard, circle the numbers of the items you'd like to know more about. You'll get information direct from the manufacturer—without obligation.

**Materials News Section:** Starts on page 244. Out of the many new materials announced each month, FACTORY's Editors pick out those most useful to you. In the Materials News Section, circle the items you want to know more about. You'll hear direct from the manufacturer—no obligation.

**Advertising Section:** The postcard has numbers corresponding to the page numbers of the advertisements. Circle the page numbers of those you're interested in. Where more than one advertisement is on a page, the letters L, R, T, B indicate location: left, right, top, bottom.

**Then be sure:** Fill out your name, address, and other information in the space provided, tear out the card, drop it in the mail. The data requested will be forwarded to you shortly.

---

**FACTORY: Send me more information about . . .** **AUGUST 1955**

**(Good until October 31, 1955)**

**. . . items in the CATALOG NEWS SECTION as circled below:**

| | | | | | | | | | | | | | | | | | | | | |
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| 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | | | | | | |

**. . . items in the EQUIPMENT NEWS SECTION as circled below:**

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| 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 |
| 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | 65 | 66 |
| 67 | 68 | 69 | 70 | 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 |
| 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 100 | 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 109 | 110 |
| 111 | 112 | 113 | | | | | | | | | | | | | | | | | | |

**. . . items in the MATERIALS NEWS SECTION as circled below:**

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |

**. . . items ADVERTISED on the pages circled below:**

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 16a | 16b | 17 | 18 | 19 | 21 | 23 | 25 |
| 27 | 29 | 31 | 32 | 33 | 35 | 39 | 41 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 |
| 59 | 60 | 61 | 62 | 63 | 64 | 65 | 66 | 129 | 131 | 133 | 135 | 137 | 139 | 140 | 141 | 142L | 142R | 143 | 146T | 146B | 147T |
| 147B | 148 | 149 | 150 | 151 | 152 | 153 | 154 | 155 | 156 | 157 | 158 | 159 | 160 | 160a | 161 | 162 | 163 | 164 | 165 | 166 | 167 |
| 168 | 169 | 170 | 171 | 172 | 173 | 174 | 175 | 176 | 177 | 178 | 179 | 180 | 181 | 182 | 183 | 184 | 185 | 186 | 187 | 188 | 189 |
| 190 | 191 | 192 | 193 | 194 | 195 | 196 | 197 | 198 | 199 | 200L | 200T | 201 | 203 | 204 | 205 | 206 | 207 | 208 | 209 | 210T | 210B |
| 211 | 212 | 213 | 214 | 215 | 216T | 216B | 217 | 218 | 219 | 220T | 220B | 221 | 222 | 223 | 224L | 224R | 225 | 226 | 227 | 228 | 229 |
| 230T | 230B | 231 | 232 | 233 | 234L | 234R | 235 | 236 | 237 | 238 | 239 | 240 | 241 | 242 | 243 | 244 | 245 | 246L | 246T | 246B | 247 |
| 248T | 249 | 250 | 251 | 252 | 253 | 254 | 255 | 256 | 257 | 258 | 259 | 260 | 261 | 262 | 263 | 264 | 265 | 266 | 267 | 268 | 269 |
| 270 | 271 | 272 | 273 | 274 | 275 | 276L | 276T | 276B | 277 | 278T | 278L | 278R | 279 | 280L | 280T | 280B | 281 | 282L | 282R | 283 | 286L |

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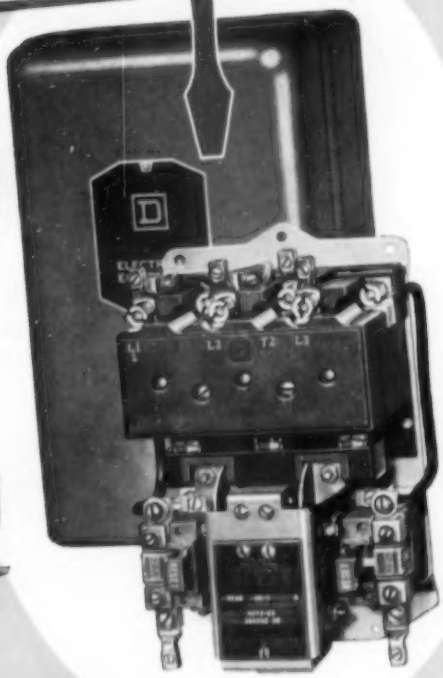

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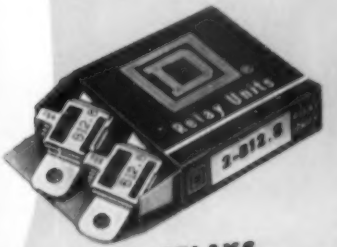


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